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SAMBUCUS CANADENSIS.

By Frank F. Lyons, Ph.G.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 99.

Sambucus Canadensis is one of the best known of our indigenous drugs, and is widely distributed over this country from Canada to the Carolinas. It flowers from May to July and under the name of "elder flowers" is a common sight in low moist grounds, along fences and on the borders of small streams.

While various parts of the plant are medicinal, only the flowers are recognized by the Pharmacopœia. They are small, white, with a wheel-shaped corolla having five stamens inserted in the tube, and are arranged in loose five-rayed cymes.

In some parts of the country they have long been known as a carminative and diaphoretic, and for this purpose a favorite mode of administration is that of boiling in milk, to which liquid they seem to impart their medicinal as well as aromatic properties.

They have also been used as an application to inflamed surfaces, either as a cataplasm or an ointment made from an evaporated fluid extract. Probably their principal uses are as a perfume and a vehicle to disguise the taste of more disagreeable medicines.

The drug appears in commerce in pressed packages and dealers make a special effort to have them as white as possible. To do this it is necessary to dry them with the greatest care and as rapidly as possible.

A quantity of the drug was obtained from a reliable source, and subjected to a chemical examination with the following results:

A portion weighed and dried at 100° was found to contain 13·13 per cent. of moisture. A second portion on ignition yielded 6·67 per cent. of ash. Of this 12·95 per cent. was soluble in water, and 80·64 per cent. soluble in diluted hydrochloric acid. Fifty grams were then subjected successively to the following plant solvents: Petroleum ether extracted 3·32 per cent. by maceration. When heated at 110° to constant weight it was found to have lost a quantity of volatile oil, amounting to 0·5 per cent. of the drug. This oil may be obtained from the flowers by distillation with water, and at ordinary temperatures is a yellowish solid of about the consistence of butter, and having an aromatic odor and a slightly bitter taste. It is lighter than water, and somewhat soluble in it.

The remainder of the petroleum ether extract consisted of some fat soluble in 95 per cent. alcohol and of a crystalline greenish-yellow wax, melting at 40°, soluble in and deposited from hot absolute alcohol. Maceration with stronger ether gave a deep yellow liquid, which, upon evaporation, yielded 3·13 per cent. of extractive. This was digested with acidulated water, and the resulting aqueous liquid shaken successively with petroleum ether, ether and chloroform. The last solvent extracted an amorphous yellow compound, having the peculiar odor of the flowers and a very bitter taste.

This chloroform extract, when dissolved in water, produced no change with iron salts, but did reduce Fehling's solution. The yellow color of this extract was almost destroyed by acids, but restored to the deep yellow color of the ethereal extract by alkalis. The remainder of the ethereal extract was found to consist of a tasteless, inodorous resin, and to amount to 2·92 per cent.

Maceration with absolute alcohol gave a deep yellow liquid, which upon evaporation yielded 3·16 per cent. of extractive. One-half of this residue was found to be soluble in water to which it imparted an acid reaction. Ferric chloride was colored dark by this solution, but no evidence of tannin was obtained in it by gelatin and alum. The portion of the aqueous solution remaining after the above tests was agitated successively with petroleum ether, ether and chloroform. From the last solvent an amorphous yellow compound was obtained which, though odorless, had the peculiar bitter taste of the flowers. After heating with hydrochloric acid this substance readily reduced Fehling's solution.

Water extracted from the residual drug 21·48 per cent., consist-

ing of 6·48 per cent. of mucilage; 5·76 per cent. of glucose; 1·60 per cent. of saccharose, and 2·30 per cent. of a peculiar substance resembling tannin, as it was precipitated by gelatin and alum and gave a dark color with ferric chloride.

Dilute sodium hydrate extracted from the remaining drug 5·40 per cent. of pectin and albuminoids, and the remainder of the drug was found to be composed of 3·91 per cent. of lignin and 19·67 per cent. of cellulin.

MULLEIN OIL.

Editor of American Journal of Pharmacy:

The December number of your Journal contains an article on "Mullein Oil" in which our firm, under cover of the words "A prominent homœopathic pharmacy," is charged with "petty deception to introduce an article at exorbitant prices." This charge is grossly unjust, uncalled for and libellous, and in common fairness we ask you to publish our reply to Mr. George M. Beringer's attack on our business and pharmaceutical honor. The best reply we can make is the plain facts of the case, which are as follows:

About eight years ago Dr. A. M. Cushing, of Springfield, Mass., published a paper in the *United States Medical Investigator*, of Chicago, on the subject of Mullein oil. We had numerous calls for the preparation and wrote to Dr. Cushing to ascertain how it was made. His reply, in substance, was that mullein oil is made by putting the freshly gathered mullein blossoms in a dark colored bottle, and exposing the bottle to the sun for four or five weeks. By this process, a sort of dry distillation, a dark colored, aromatic liquid is obtained, miscible with either alcohol or water, that is called "mullein oil" by the country people, which name neither Dr. Cushing nor ourselves saw fit to change. We may also state that to this liquid is added about 15 per cent. alcohol to prevent fermentation. We are quite well aware that the article is not an "oil" and have repeatedly explained what it is, and how made, in the journal published by us, *i. e.*, the *Homœopathic Recorder*. We also know that the Dispensatory mentions a "mullein oil" made by the country people of Germany, but as it is not an officinal preparation, nor as good a preparation as the one prepared according to Dr. Cushing's method, we cannot see that it is entitled to the name to the exclusion of the better article, and this especially as the German prepara-

tion is not an oil obtained from the mullein. The charge that the price is "exorbitant" is clearly the result of ignorance on the part of the man making it, and its falsity can be attested to by any one who has had any experience in making the article. In conclusion: The medical profession asked for a certain article made in a certain manner, and under a certain name; we simply complied with their demands and nothing more. Had Mr. Beringer had the courtesy to ask us for information on the subject instead of going about it in an underhand manner, as though he were a detective and we engaged in a criminal occupation, we would cheerfully have given him all the information on the subject we possessed.

BOERICKE & TAFEL.

Philadelphia, December 19, 1891.

FORMULAS FOR SEVERAL PHARMACEUTICAL PREPARATIONS.

CONTRIBUTED BY GEORGE M. BERINGER. PH.G.

Read at the Pharmaceutical Meeting of the Philadelphia College of Pharmacy, Dec. 15.

These formulas are submitted in reply to queries received by the committee on pharmaceutical meetings.

Neutralizing Cordial.—This was formerly much used by the eclectics, and the formula as given in King's Dispensatory, p. 1285, is as follows:

Take of—

Rhubarb in coarse powder, Potassium carbonate,	each two ounces.
Golden seal, Cinnamon,	each one ounce.
Refined sugar,	four pounds.
Brandy,	one gallon.
Oil of peppermint,	twenty minims.

Macerate the rhubarb, golden seal and cinnamon in half a gallon of the brandy for six hours with a gentle heat; then transfer the mass to a percolator and displace with the remaining brandy. The remaining strength, if there be any, can be obtained by adding water until the liquid comes off tasteless. To the percolate add the potassium carbonate, sugar and oil of peppermint, the latter having been previously rubbed with sufficient sugar to absorb it, and mix the two percolates.

It is stated that 76 per cent. alcohol may be substituted for the brandy.

Liquor Carbonis Detergens.—Hans Wilder published some years ago, in the Druggists Circular, the following:

Tincture of quillaia, ... 4½ pints.
Coal tar, ... 2 pounds.
Digest for 8 days and filter.

The tincture of quillaia is to be made by percolating two pounds of soap bark with 65 per cent. alcohol until one gallon of tincture is obtained.[1]

The British Pharmaceutical Conference adopted in the Unofficial Formulary a formula for this preparation under the title of

Liquor Picis Carbonis (solution of Coal Tar):

Take of—
Quillaia bark in No. 20 powder, ... 2 oz.
Rectified spirit,[2] a sufficient quantity.

Moisten the powder with a suitable quantity of the menstruum and macerate for 24 hours in a closed vessel. Then pack in a percolator and gradually pour rectified spirit upon it until one pint of percolate is obtained. To this add:

Prepared coal tar, ... 4 ounces.

Digest a a temperature of 120° F. for two days. Allow to become cold, decant and filter.

Prepared coal tar is commercial coal tar, which has been exposed in a shallow vessel to a temperature of 120° F. for one hour, stirring frequently.

Solution of the Four Chlorides.—(Formula of Dr. Wm. Goodell):

Take of—
Hydrarg. bichlor. corros., ... grj
Liq. Arsenici chl., ... ♏xlviij
Tinct. Ferri chloridi, } . . . . . āā ℥iv
Acidi Hydrochlorici dil., }
Syrupus Zingiberis, ... q.s. ad ℥iij
Misce. Sig.—One-half to one teaspoonful in water after meals.

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[1] *Coaltar saponiné of Lebeuf.*—
℞
Soap bark, ... 1 part.
Alcohol, ... 5 parts.
Heat to boiling and filter. Take 24 parts of this tincture, digest it for 8 days in a warm place with 10 parts of coal tar. Label this: Tincture for coaltar saponiné. To make the liquor use one part of the tincture to four parts of water.—J. W. ENGLAND.

[2] Rectified spirit, Br. Ph. contains 57 per cent. by volume of alcohol.

This preparation is being prescribed quite frequently, and several formulas disagreeing with each other have been published. The above is an exact copy of the formula recently received direct from Dr. Goodell.

Unguentum Boroglycerini.—The formula used by the writer is as follows:

Solution of Boroglycerin (50 per cent. in glycerin), ...	25 parts.
Petrolatum, ...	75 parts.

Oil of Rose or Rosegeranium, a sufficient quantity. Mix.

CREASOTE PILLS.

By Joseph C. Roberts, Ph.G.

Read at the Pharmaceutical Meeting of the Philada. College of Pharmacy, Dec. 22.

In answer to the query as to the best excipient for making creasote pills, it may be stated that Tobisch[1] recommends the mixing of one part of creasote with two parts of unpeeled powdered licorice root, leaving the mixture stand for a few minutes, and then making up the mass with water as an excipient. Prior to this suggestion of Tobisch, we had tried his method only to obtain a failure. While the licorice root furnished absorbency, the mass formed was very friable, and lacked the necessary plasticity. Further, it was noticed, that on standing, the creasote was forced to the outer surface of the pilular mass, probably from a greater affinity of the licorice root for water, than for an oily liquid like creasote. To obviate these objections, the following procedure was adopted with excellent results. Mix two parts of creasote with three parts of powdered licorice root, and when absorption has taken place, add one part of powdered soap, and make up with syrup; samples of the two products are here presented for comparison.[2]

ELIXIR OF YERBA SANTA.

By Theo. H. Strouse.

Read at the Pharmaceutical Meeting of the Philadelphia College of Pharmacy, Dec. 15.

Yerba Santa possesses very little medicinal properties, except, probably, in allaying slight inflammation of the bronchial mucous membranes, but its value is established for its property of disguising

[1] Zeitsch. Allg. Oest. Ap. Ver.; New Idea, 1891, 283.

[2] For formulas for creasote pills, see also Am. Jour. Pharm., 1889, 559, 1890, 17, and 1891, 292.

the bitter taste of substances like quinine and other cinchona alkaloids, in which use it has successfully stood the test against all other drugs. It is employed generally in a syrup or an elixir form. The preparation I have submitted is virtually a compound or aromatic elixir, indeed, my formula suggests polypharmacy to a high degree, but, after a number of experiments in its preparation, by employing different aromatics, etc., I finally concluded that this elixir was my ideal; and hope that if I have transgressed the rule of modern pharmacy—simplicity—the preparation itself will furnish the excuse. I herewith submit a sample, and a working formula:

℞

Yerba Santa,	3 oz.
Sweet Orange Peel,	1 oz.
Cardamon, Cloves, Cinnamon,	of each 1½ drachms.
Anise, Coriander, Caraway,	of each 1 drachm.
Red Saunders,	½ "
Sugar (Granulated),	1½ lbs.
Alcohol, Glycerin,	āā 6 f. ozs.
Distilled water sufficient for 2½ pints.	

Reduce the drugs to a No. 40 powder. Macerate for 24 hours and percolate with the mixture of alcohol, glycerin and water, until 2½ pints have passed through. Filter this solution and percolate it through the sugar.

THE PRESENCE OF COPPER IN SOME COMMERCIAL GALENICAL PREPARATIONS.

By F. W. Haussmann, Ph.G.

Read at the Pharmaceutical Meeting of the Philadelphia College of Pharmacy, Dec. 15.

The introduction of numerous new remedies, the addition of new groups of galenical preparations to the Pharmacopœia within the last 20 or 30 years, and the demand made for these various preparations have added a new phase to the profession of pharmacy. It is impossible at the present day for the retail pharmacist to meet all demands made upon him in this line by the medical profession as well as the public, and he is forced to apply to manufacturers of these articles for a part of his supply. To what extent he is com-

pelled to take to this resource is shown by the number of these manufacturing firms in this country. Almost every wholesale drug house has a department of this nature attached, and it cannot be denied, that the pharmacist, especially in an urgent call, appreciates the service of such an institution. It is reasonable to assume, that in the manufacture on the large scale, other means than those of the retailer must be employed; that, with a view to both economy of time and money, alterations are employed both in working methods and the various utensils. It is of the latter, that our subject mainly treats.

Every pharmacist is acquainted with the fact that metallic surfaces, when in contact with liquids for some time, are more or less corroded, and that some of the metallic substance will pass in solution. This is also the case with the working utensils of the pharmacist, as well as of the pharmaceutical chemist working on the large scale. The latter employs in most instances vessels and general working tools made of copper, probably with a consideration as to durability and the facility of cleaning.

Accidentally the writer made the observation, that a contamination by copper was present in certain classes of preparations, especially fluid extracts. A brightly polished steel spatula, was left in contact with a mixture of several fluid extracts, and on removing the same a bright film of copper was found to be deposited upon the iron. Experiments were made to determine to what extent this was the case in the fluid extracts of one firm, and later this was extended to those of several others.

The method employed is very simple. A freshly polished, untarnished steel spatula is placed in about half an ounce of the suspected extract and allowed to remain some time. In some instances the copper will deposit without the necessity of acidulation, while again in others it does not take place, unless an addition of a slight amount of acid is made.

Small amounts of the metal are not detected by this method. The application of reagents would perhaps detect traces, but the separation of the vegetable constituents meets with considerable difficulty. For a rough examination it answers very well.

A number of fluid extracts obtained from eight different manufacturing firms were examined, the number varying from 16 in one case to only 2 or 3 in others.

The following are the figures obtained.

(1) Out of 16 different fluid extracts examined, 9 gave decided indication of the presence of copper, the other 7 only slightly so or none at all.

(2) Ten were examined. Not acidulated, the extracts from this source showed but little indication, but on the addition of a trace of sulphuric acid, in several very plain deposits were obtained. Out of the 10, only 4, however, gave a decided copper indication.

(3) Nine were examined. The same may be said as in the preceding group. Acidulated extracts gave very positive evidence. Out of the 9, five very prominent, the rest none or very slight.

(4) Five were examined, 3 of which contained copper.

(5) Five were examined, none of which appeared to contain copper. They were all alcoholic and had been standing at least 3 years.

(6) Four were examined. The menstruum was in two cases entirely alcoholic, one diluted alcohol and the other largely aqueous. None gave any indication of copper.

(7) Three were examined, each one contained copper, in one case very pronouncedly so.

(8) Only two were at disposal; both gave very bright deposits.

Out of the 8 different makes of fluid extracts, only two makes gave no sign of this metallic presence.

In examining the deposit upon the spatula a few sources of error are to be guarded against, viz: Fluid extracts containing yellow coloring matter, such as hydrastis or rhubarb, may stain the spatula to a similar color as that of the copper deposit. Closer examination, however, readily points out the difference, the uniform metallic deposit varying from the streaky one of such extracts or those containing resin. Daylight, it may be incidentally stated, is best for the examination.

In extracts from drugs containing vegetable acids, such as malic or tartaric, acidulation may usually be dispensed with, as in the presence of these, the deposit, if any copper be present, quickly takes place. A fluid extract of sumach berries deposited copper in the short time of 10 minutes upon the spatula.

It is a well known fact, that copper salts are precipitants of tannin, the acetate being used in the quantitative estimation of that constituent. Fluid extracts, containing large amounts of it, gave

usually no indication of copper, and if the above be considered, the reason is obvious.

In some, which showed precipitation, the clear, supernatant portion gave no reaction for the metal, but if acidulated and the precipitate thoroughly mixed with the liquid, bright deposits soon formed.

Alcoholic fluid extracts, due to the non-corrosive action of that liquid, give hardly any indication, but a few have been found to contain traces.

The time of contact between the spatula and the extracts varied, in some cases being only 30 minutes, in others 6 to 8 hours. A number of commercial *solid extracts* were also examined with similar results. These examinations were made with both simple and acidulated aqueous solutions of the extracts. Acidulation is necessary in most cases, as, while some samples in simple solution readily gave indication of copper, others failed to show its presence, unless made slightly acid. This is particularly the case with tannin-containing extracts. Of the 10 samples examined of one firm, five contained copper, some very decidedly so.

Powdered Extracts have within the last ten years almost superseded the solid, possibly due to their more convenient division. A number of these were examined, but mostly with a negative result. Some appear to contain copper, but so small an amount, that a positive assertion cannot be made.

These 3 groups were the commercial preparations examined, others, such as abstracts, were not looked into.

The question may be asked, if the presence of this metallic contamination can have any decided, injurious effect upon the taker, also if it is present in sufficient amount to cause poisoning? This may be partly denied, as the preparations examined are seldom taken in large enough doses to contain a toxic dose of the copper, although some fluid extracts, as stated before, contain a comparatively large amount.

Another question would be, however, whether the *continued* taking of a copper-tainted fluid or solid extract may do any harm. Much has been said and written of the copper contaminated "soda water fountain," and if the so-called poisonings through this source be true, it may be fair to assume that not a single but frequently repeated draughts of the beverage have caused the difficulty.

It presents a singular complication that in the remedies of those who are requested to furnish the means of cure in possible cases of such metallic poisoning, the same deleterious substances are found, which cause disease and, perhaps, death in others.

One remedy is, however, in the hands of the pharmacist to guard against such a possibility, and it is to be regretted that at the present time it is so seldom used if not almost impossible—the method of self-preparation.

OXYGEN AND ITS MEDICINAL APPLICATION.

By Joseph W. England, Ph.G.

Read at the Pharmaceutical Meeting of the Philadelphia College of Pharmacy, Dec. 15.

It was a happy thought of the rational therapeutist to suggest the employment of oxygen gas as a remedial agent. To Dr. S. B. Birch, of England, belongs the credit of first using it in that country in 1857. Demarquay, in 1866, gave an exhaustive history of previous experiments together with much original matter, while in this country, Dr. S. S. Wallian, in 1869, and Dr. A. H. Smith, in 1870, made the subject one of special inquiry. All of these results, however, failed to enlist medical sympathy, and it was not until 1883, when a lengthy paper of Dr. Wallian's was published on the subject, that medical thought was directed towards its value. Since that time its use has gradually extended, until to-day it is very generally accepted as one of the best respiratory stimulants known. The reason for this is apparent, when it is stated that it gives the oxygen carriers of the blood—the red blood corpuscles—five times as much oxygen as they usually obtain from the air, and thus enables them to carry five times their usual quantity of oxygen gas to the tissues for oxidation purposes. With its increasing use, it is desirable that we, as pharmacists, should be thoroughly familiar with the manner of its making, so that the physician's wants can be readily supplied. With this object in view, this paper has been written.

Oxygen of itself is not difficult of preparation; the main thing in its making is care to prevent the presence of impurities. The most dangerous of these is chlorine gas, which must be excluded. Oxygen gas may be obtained commercially in steel cylinders containing 100 gallons of compressed gas, but as good and a far cheaper product can be made with one of the different oxygen apparatus

now on the market. The one in use by the writer consists of a wooden box having five parallel compartments in the back for wash bottles of a pint capacity, each bottle having a rubber cork with two tubes, one dipping down into the contained liquid, the other for the escape of the washed gas. Each of the bottles is connected with the other by means of rubber tubing, very much in the same way as in the Woulff bottle. The first bottle, however, is connected with the generator, and this needs to be described.

The generator is placed in front of the wash bottles and consists of two cylinders joined together at the centre in an L-shaped fashion by means of a conical stand or support, both of which cylinders or retorts are removable from the stand, which latter is firmly attached to the box. In the horizontal copper cylinder there is placed the mixture for generating the oxygen gas, while through the upright one passes the gas generated. Attached to the posterior part of the upright cylinder, there is connected a somewhat smaller cylinder by means of a lateral tube at the top for the purpose of condensing any moisture which may be present in the oxygen-producing mixture (which liquid may be removed at a bottom orifice on removing a rubber cork), and also, to receive the powdered mixture in case it should be carried over mechanically from the horizontal tube by excessive heat. Were this not the case explosion might result.

After the gas is generated by heating the horizontal tube, it passes in succession through the lateral upright cylinder and then through two series of wash bottles. The first two contain a solution of sodium hydrate, 90 grains in ten fluidounces of distilled water. The third and fourth contain a solution of silver nitrate, 15 grains in ten fluidounces of distilled water. The last bottle is filled with absorbent cotton to dry the gas as it passes through it. After this, by means of rubber tubing, the dried gas passes into rubber bags of ten gallons capacity, closed by means of a vulcanite stopcock. When full the bag is disconnected. To use the gas, there comes a pint inhaling bottle, which is to be half filled with water prior to use. It is simply an ordinary wash bottle with rubber cork, tubes and tubing for connection with the mouth and the supply in bag.

The mixture for generating the gas is composed of powdered potassium chlorate, four pounds; manganese dioxide, one pound; and precipitated ferrous carbonate, sixty grains. Mix and triturate well in a wedgwood or porcelain mortar, avoiding force or severe con-

cussion. Sift several times through a moderately fine sieve, and dry in a moderately heated oven, leaving the door open. It is essential that pure potassium chlorate and manganese dioxide containing no organic matter, be used. For the former, the writer always uses the English brands, and for the latter the Russian. This manganese dioxide in addition to being purer than that usually found in commerce, presents the added advantages of being more "grainy" in character, and less liable to fill up the condensing chamber. As to the utility of precipitated ferrous carbonate in the mixture, that is an open question. It is claimed that it absorbs any free chlorine gas generated, converting it into ferric chloride. In the absence of preservative agents, however, ferrous carbonate is rapidly changed into ferric carbonate on exposure to air, and it is most probable that after drying this change ensues; so in the making of the generating mixture the writer has left out that compound, and his results have been all that could be desired.

To generate the gas, heat the horizontal cylinder or retort, at the end attached to the central support, and when the gas from the material directly over it is exhausted, move the lamp or burner an inch or so towards the other end of the retort. Continue until the quantity of gas desired is obtained. The rapidity of evolution of gas may be gauged by the bubbling of gas through the wash bottles; when the cylinder is exhausted the bubbling will abruptly cease. A freshly filled cylinder must be used each time the gas is generated. If the contents of one cylinder do not yield sufficient gas, a second one must be used. After applying the heat, promptly remove the rubber cork from the bottom of the posterior upright tube or condenser, or there may be sufficient back-pressure from partial vacuum to cause trouble.

When from use the absorbent cotton in the fifth, or drying bottle becomes saturated with moisture, it should be removed and replaced with dry. The retorts are cleaned with hot water, and thoroughly dried before being used again. In filling the retorts care must be taken to prevent any form of organic matter, such as paper, wood or cotton fibre, from mixing with the material; otherwise an explosion by oxidation may result. Renew the solutions in the wash bottles as often as they become decomposed. No fixed rule can be given; but, in general, if pure chemicals be used, after 300 to 500 gallons of gas have been generated. The gas generated can be retained in

the rubber bag for some time, but the fresh gas is the more active. On keeping, more or less loss of gas, by transudation through the rubber bag, occurs.

In certain emergency cases, such as asphyxia, membranous croup, diphtheria, chloroform or ether narcosis, the freshly made gas is stated to be far superior to the gas which has been kept on hand. It is seldom necessary to use the oxygen of full strength, and there should be an interval of from one to three minutes between inspurations. To dilute the gas, first fill the rubber bag half full with air by means of a hand-bellows. Generally, fifty per cent. oxygen is as strong as it is advisable to exhibit, although at the Philadelphia Hospital, the full strength is always used. The exceptions to this rule are to be found in asphyxia, cyanosis, diphtheria and other critical emergencies. The gas should be inhaled slowly and deeply, never in a rapid or nervous manner.

CONVENIENCES IN THE PHARMACY.

By Clement B. Lowe, M.D.

Read at the Pharmaceutical Meeting of the Philadelphia College of Pharmacy, Dec. 15.

It is no uncommon thing in these modern days to see pharmacies that are beautiful with silver, plate-glass and polished wood, but often the proprietor spends so much on mere modern adornment as not to feel like buying many things which are not only of the greatest convenience, but are almost indispensable. I have in mind a store once owned by an excellent pharmacist (theoretically) which, though quite deficient in appliances and conveniences, was further ornamented by the proprietor purchasing, on his visit to New York, an angel of cast iron and heroic size, to be placed in front of his establishment.

I do not propose in this brief paper to draw your attention to all of the conveniences which should be a part of every well-equipped pharmacy; for to do that I should have to write a book, and have we not already Remington's Pharmacy? I simply desire to draw your attention to a few of the conveniences which have been helpful to me.

The first one is *indexing* or *cataloguing* the store. For years, like most pharmacists, I got along without it, but since doing so, I have found it of the greatest convenience, although previously having the bottles and drawers alphabetically arranged. My shelv-

ing is divided into sections, like that of most other stores. On the cornice over each section is cemented a one-inch porcelain letter, which is large enough to be seen distinctly, and yet is not unpleasantly obtrusive. The first section is called A, the second B, and so on, the shelves being numbered from above downwards. Any closet in a section is designated by the letter C; if there is a lower one by the letters C C. For cataloguing I use Nelson's price-list, although any full one would do as well. If a new clerk (temporarily in charge) should wish to find pomade vaseline, he turns to the price-list, finds the name, and following it sees Sect. B, C, S. 2, which means section B, closet, shelf 2. The index is of great use in finding articles which are but seldom called for, which I hardly know whether in stock or where placed.

A convenient arrangement is the keeping of the drugs which are to be sold by weight, in the front part of the store, handy to the scales, and the liquids in the rear convenient to the prescription counter; also to have duplicates of nearly all powdered drugs upon the prescription counter. Upon the bottles containing those potassium salts most frequently dispensed, I have large capital letters pasted, which catch the eye at once, viz: A for the acetate, B for the bromide, C for the chlorate, I for the iodide and N for the nitrate.

By the *pill tile*, which is imbedded in a slide at the end of the prescription counter, I have a row of small bottles with sprinkler tops, containing powd. licorice root, powd. gum arabic, powd. gum tragacanth, lycopodium and rice flour; also small jars containing glycerite of starch and glycerite of tragacanth, to be used as excipients.

It is hardly necessary to say that I keep *poisons* in a closet entirely distinct from the prescription counter; but I do not have a bell upon the doors, the ringing of which will announce to some timid customer that I am about putting a poison in their prescription.

The glass labels of my shelf-ware that contain preparations poisonous in small doses have a *black* background, the others a *white* one; the black label catches the eye at once and puts the dispenser on his guard.

Upon the inside of the glass doors of the poison closet, I have fastened minimum and maximum dose tables so as to be read from

the outside. It is arranged according to the classification of the U. S. Pharmacopœia, but is not confined to the articles in it. This convenience for quick and accurate dispensing is greatly appreciated by my clerks.

Another great convenience is the method of *filing prescriptions* by means of a Shannon binding case of special size, 7½ x 9¼ inches, each one holding about 750 prescriptions. It is cheap, does not take up much room when open upon the counter, and gives easy access to the prescriptions, anyone of which can be readily taken from the file.

I also exhibit to you two *ointment tiles*, which consist of pieces of plate glass 12 x 12, one painted black upon the back for mixing light-colored ointments upon, the other white for dark ointments, and each imbedded in a walnut slide. It would have made a neater finish if the wood had been painted instead of the glass.

I also call your attention to a *container for ointments* which are most largely used, such as cold cream. It holds about 2 pounds, resembles a small bucket, is made of heavy tin, and has a slot in the lid for the spatula, each can having its own spatula, which saves the time ordinarily spent in cleaning the spatula after using.

A convenience which I hope to have when provided by some enterprising manufacturer, will be a hard *rubber spatula* for mixing those ointments which act upon metal; horn spatulas are absorbent and soon warp.

Another convenience which, if "cleanliness is next to Godliness," should have been placed first, is an abundant supply of *hot water* which I obtain by utilizing the store heater. Three stout pieces of heavy iron pipe, about twelve inches long, are connected parallel with each other by short elbows and placed in the heater above the fire pot on one side; this is connected with a circulating boiler and gives all of the hot water needed in the laboratory, at the soda counter and in the prescription department, and has cost nothing for repairs for some eight years.

In the corner of the store adjoining the sink, and arranged to drain into it, I have a small counter covered with zinc, and overhead a part of it a hood connected with a flue running into the chimney, while gas is conveniently arranged for heating and lighting. Many minor operations which cause unpleasant odors or gases can be carried on in this place.

Other conveniences might be mentioned but perhaps those already brought to your attention are sufficient to show that the store in which the pharmacist spends the most of his life offers a wide range for inventive genius.

DISPENSING LIQUIDS IN CAPSULES.

By C. Carroll Meyer, Ph.G.

Read at the Pharmaceutical Meeting of the Philadelphia College of Pharmacy, Dec. 15.

In looking over the December number of the Alumni Report, I noticed among the Pharmaceutical Queries, one which was of special interest to me, viz: What is the best method of dispensing liquids in capsules? I have had considerable experience with this method of dispensing liquids, and while mine may not be the best method, it is a practical one that any pharmacist can adopt.

The appliances necessary are a minim measure, a pipette, a camel's-hair pencil, and an empty shallow straw or card-board box, a tooth brush box for instance, to make a holder in which to place the capsules. First punch holes in the box, the exact size of the capsule to be used, from ½ to 1 inch apart. If of a mechanical turn of mind the pharmacist can also utilize a segar box. If minims be ordered, drop in the capsule carefully from minim measure. If the prescription calls for drops use a pipette, being careful in all instances to get the liquid *inside* of the capsule and not on the outside. Then take the top or cover of the capsule, moisten this slightly inside with warm water using a camel's-hair pencil, place the cover or top on the filled capsule, roll slightly with top up between thumb and first finger for several seconds, press gently but firmly together. Place the capsule in the holder to dry and set the holder in a cool place until the joints are tight. In my experience I find that volatile oils, etc., work better if mixed with an equal quantity of a bland fixed oil, *i. e.*, refined cotton-seed oil, or the so-called olive oil.

Points to be observed: Care must be taken to keep the liquid from the outside of the capsules. If the liquid gets on the outside, throw the capsule away and take a new one. Measure the volumetric capacity of your capsules and always *use a capsule that holds an amount in slight excess* of that required. As far as possible, a minim measure should be used.

A SIMPLE METHOD FOR THE PRESERVATION OF SYRUP OF IODIDE OF IRON.

By A. L. Beck, Ph.G.

Read at the Pharmaceutical Meeting of the Philadelphia College of Pharmacy, Dec. 15.

That the subject of syrup of ferrous iodide in a permanent form, or a method for its preservation under the varying conditions of dispensing, is an interesting one to our profession, is shown by our pharmacal literature ever since its virtues as a therapeutical agent have been recognized. Many have been the suggestions relative to improved formulas for making, and methods to prevent oxidation and the subsequent liberation of free iodine, in the officinal syrup.

Prof. Remington refers to the use of a layer of vegetable oil as a satisfactory way to exclude the action of the air, but the thorough cleansing of the bottles is the objection to its use. The addition of hypophosphorous acid, which is said to be the method adopted by most manufacturers to secure stability, is objectionable, if for no other reason, because it is an unauthorized addition. The method of the Pharmacopœia of preserving in small vials is satisfactory if the whole of the contents is to be dispensed, but if a portion remains in the vial, the conscientious pharmacist will certainly suffer loss.

It is the purpose of this paper to offer another simple method for preservation that the writer has used satisfactorily for more than a year, by the use of carbonic acid gas. The idea was suggested when assaying an iron ore, in which the ferrous sulphate is protected by carbon dioxide from oxidation by the air.

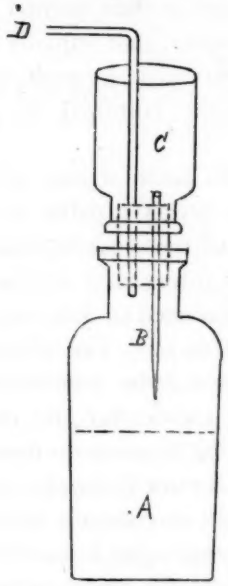
One thousand grammes of the syrup was prepared and put into two pint douche bottles, provided with pinch-cocks at the lower orifice, for drawing the syrup as required, and a rubber tube at the top supplied the CO_2 from an improvised generator, described elsewhere, and is shown by the illustrations exhibited with this paper. One of the bottles was securely corked and set away until needed.

On the first trial a slight tinge of iodine was developed on the top within the first twenty-four hours, but did not increase, and the bottle was used as required in dispensing without further change. In subsequent trials care was taken to allow considerable of the gas to flow over the syrup, and drive out all of the air, before corking tightly, with very satisfactory results.

No change is perceptible in the syrup from prolonged contact with the gas, the color and transparency remaining to the last.

Several methods for the automatic generation of the gas were tried, and the two simple pieces of apparatus shown by the photographs exhibited were found efficient.

A bottle of about the same size as the syrup bottle, and partly filled with dilute sulphuric acid, is connected through the cork by means of a siphon tube with a smaller bottle containing a concentrated solution of carbonate of sodium, and the gas is supplied to the well-corked syrup bottle by another tube fitted into the corks of



the acid and syrup bottles. When a portion of syrup is drawn, the partial vacuum formed in the bottles causes the solution of the carbonate to flow over into the acid, generating sufficient gas to replace the syrup drawn ; the excess of gas, if any, escaping through the siphon tube and the carbonate solution. In another apparatus of more recent construction, the gas is kept under slight pressure by the weight of the liquid in the tube *B* and reservoir *C* as shown in the line diagram, which clearly shows its construction.

I find the specific gravity of the officinal syrup, very carefully made, and accurately tested, to be 1·429.

Sharon, Pa., Dec. 14, 1891.

IODINE: A NEW METHOD OF GIVING IT.

By Joseph W. England, Ph.G.

That glucose possesses strong reducing qualities has long been known, and, assuming that if it was so strongly opposed to oxidation, it should serve to protect easily oxidizable substances from oxidation, the writer, in 1888, suggested the use of solid glucose for preserving syrup of ferrous iodide, and, later, the use of syrupy glucose for preserving syrup of hydriodic acid, and practice has borne out the truth that theory taught. Here are shown some samples of syrup of ferrous iodide made with glucose in 1888. You will observe that they still retain their normal green tint unimpaired. It is but fair to say, however, that equally as good preservative results have been obtained with hypophosphorous acid, in the quantity recommended by the National Formulary for solution of ferrous iodide.

Whilst glucose possesses such strong reducing qualities, who would have thought that it was capable of reducing the element iodine with the formation of colorless hydriodic acid, to a certain extent at least? A very interesting article upon the therapeutical application of iodine reduced in this way, appeared in a recent issue of the *Therapeutic Gazette*. The editor referred to the fact that full doses of iodine cannot be administered internally except in the form of potassium iodide, for the reason that free iodine in large doses is so irritating to mucous membranes. In order to secure the specific action of a remedy for chronic disorders, it is essential that it be retained in the circulating blood for a time sufficient to exercise its specific influence upon diseased tissues. It is claimed that in glucose there exists an agent capable of occluding free iodine, so that it becomes destitute of both odor or taste, and can be given in much larger doses than an equivalent quantity of free iodine, without producing any unpleasant symptom. Further than this, it is claimed that since glucose normally occurs in the intestinal juices, in the chyle after eating amylaceous and saccharine food, in the hepatic venous blood, and as glycogen in the liver, it is probable that glucose in occluding free iodine, is in itself protected from chemical change during the process of digestion by the anti-fermentative quality of the latter, and hence may be readily absorbed into the circulation, carrying in its embrace the iodine, to be liberated during the structural changes which ensue prior to the formation of

the new blood corpuscles. In the formula recommended, thirty grains of iodine are dissolved in four fluidounces of water, by means of one hundred and fifty grains of potassium iodide; to this solution there is added twelve fluidounces of golden syrup or sugar-house syrup, or molasses, all of which contain glucose together with some organic matter, and answer the purpose as well as the artificial glucose. Lastly, for flavoring, 120 minims of spirits of gaultheria are added. Dr. F. P. Mann in the *Medical Record*[1] writes that he has obtained the most satisfactory, even remarkable, results with this preparation, where potassium iodide or syrup of ferrous iodide have signally failed. He gives the syrup in tablespoonful doses, between each meal, with a little water. He advises that the freshly made preparation be kept for full twenty-four hours before being used, as from six to ten hours are required to completely occlude the free iodine.

NOTE BY THE EDITOR.—It is strange that it frequently takes a long time before an observation made in science may find practical application. More than 37 years ago the writer experimented with syrup of ferrous iodide, which had been decomposed by exposure and contained free iodine, and ascertained that it could be restored to its original properties simply by exposure to the direct sunlight (see *Amer. Jour. Phar.*, 1854, p. 409), but that the heat of the sun, its light being excluded, had no perceptible influence upon the colored syrup. For a number of years following the publication of the paper referred to, other investigations in the same direction were published, the most important paper having a bearing on the subject of Mr. England's paper being one by E. Fougera (*Amer. Jour. Phar.*, 1860, p. 22), in which it is reported that syrup of ferrous iodide becomes entirely unchangeable by a long exposure to heat or to the rays of the sun, and that iodine forms with sugar a chemical combination. Of the latter Mr. Fougera says (*ibid*, p. 25): "This new therapeutic agent, as white and as agreeable to the taste as the simple syrup, stable in its composition, no doubt will some day take the lead among the preparations of iodine." It will be seen from this that the method of giving iodine described as new by Mr. England, was actually suggested more than thirty years ago. The effects of iodine upon the sugars has been studied only to a

[1] *Medical Record*, June 13, 1891.

limited extent; but as early as 1833 Lassaigne observed (*Jour. Chim. Méd.*, ix, 654) that on boiling iodine with solution of cane sugar, the mixture is decolorized with the formation of hydriodic acid. In 1845 Millon reported (*Compt. rend.* xxi, 828) that on warming iodine with a solution of grape sugar in the presence of potassium bicarbonate, iodoform is produced.

GLEANINGS FROM THE GERMAN JOURNALS.

By Frank X. Moerk, Ph.G.

A cheap red coloring matter for tooth-powder can be made from brazil wood. A decoction is made from 100–150 grams of the wood, and to this added 15–20 grams alum; the lake produced is sufficient to color one kilogram of tooth-powder.—*Rundschau*, 1891, 969.

Ink for writing upon glass or porcelain.—10 parts of bleached shellac and 5 parts Venetian turpentine are dissolved in 15 parts of oil of turpentine by immersing the containing vessel in warm water; after solution is effected, 5 parts of lamp-black are incorporated.—*Rundschau*, 1891, 970.

Iodoform-sponges.—Fine sponges are first cleansed by boiling with water and then placed for five days in a 5 per cent. hydrochloric acid; after thorough washing and drying they are covered with a 7·5 per cent. ethereal solution of iodoform, and set aside until the ether has evaporated.—Rittenheimer (*Prag. med. Wochensch.*), *Rundschau*, 1891, 970.

Detection of salicylic acid in salicyl-aldehyde and methyl salicylate.—In the course of an investigation of Spiræa Ulmaria, Dr. A. Schneegans and J. E. Gerock noticed that if the colored solutions which these substances form with ferric chloride be agitated with ether, the colorations due to salicyl-aldehyde and methyl salicylate were discharged, while that due to salicylic acid was not affected. In place of ether, chloroform, amyl-alcohol, acetic ether, carbon disulphide, petroleum ether, kerosene, paraffin oil, benzol, toluol, xylol and pure aceton can be used; if the coloration be obtained in alcoholic solution, diluting with the above-mentioned liquids will also discharge the color. If to 10 cc. of a solution, containing 0·020 salicyl-aldehyde, 2 cc. of a ferric chloride solution (the officinal solution diluted with 99 volumes water) be added, the violet coloration

is discharged by agitation with 5 cc. chloroform; if now 1 cc. of a solution containing 0·00002 salicylic acid be added, there remains, after agitation, a distinct coloration. This test is of practical importance in testing the artificial oil of wintergreen for free salicylic acid. If the oil be agitated with 500 parts water, and 10 cc. of this turbid mixture with 1 cc. of the diluted ferric chloride solution and 5 cc. chloroform be shaken together, a colorless mixture results if no free salicylic acid is present; if, however, 500 parts oil contain only 1 part free salicylic acid, there will be sufficient acid present in the 10 cc. of the mixture taken to produce a perceptible violet coloration if the vessel be held against a white background.—*Journ. der Pharm. v. Els.-Lothr.*, 1891, 285.

Calcium salicylate.—The following method of preparation gave very satisfactory results: 200 sodium salicylate are dissolved in 5,000 distilled water, the solution filtered and 10 solution of soda sp. g. 1·160 added; 100 pure calcium carbonate are decomposed with sufficient dilute acetic acid to form a clear and neutral solution, this is then diluted with 2,000 distilled water and added to the first solution; the precipitate is collected upon a filter, washed several times with cold distilled water and dried at a temperature not exceeding 35° C. The product forms a white, crystalline powder, odorless and tasteless, soluble in 2,000 parts cold water, more easily soluble in carbonated water and very readily soluble in acetic acid and the dilute mineral acids. It is used alone or with bismuth salicylate in diarrhœa, especially for children, also in gastro enteritis; dose 0·5 to 1·5 gram.—S. Torjescu, *Oesterr. Ztschr. f. Pharm.*, 1891, 629.

Test for Purity of Beeswax.—If a wax cylinder 3–4 cm. long and 5–6 mm. thick be placed in a test tube 8–10 cm. long and 1·2–1·4 cm. diameter and covered with petroleum-benzin so that there is a layer of liquid 1–2 cm. above the wax, the following behavior is noticed with pure beeswax. From the surface of the cylinder small pulverulent particles are loosened and after 1½ to 2 hours the quantity of wax taken will be found as a pulverulent deposit with an even surface; yellow wax may require three hours for this change, and the wax will be bleached although the supernatant liquid remains colorless or is only faintly yellow. Adulterated yellow wax generally retains the color, also coloring the benzin yellow; adulterated wax

cylinders will retain their form for a long time, i. e. as long as 2 to 4 days, and then will not fall into a powder but will split into longitudinal sections which may be straight or bent; if the adulteration amounts to only a few per cent., floccules may separate from the cylinder and after 12–24 hours the sediment will consist of floccules among which may be seen the longitudinal sections. The temperature for this test ranges from 14–18° C. (57–64·5° F.) All possible wax adulterants were examined by this test with very satisfactory results; it was also found that instead of the benzin, ether of specific gravity 0·720 could be used.—Dr. H. Hager (*Centr. Org. f. Waren-Kunde u. T.*) *Drogisten Ztg.*, 1891, 489.

The purification of tuberculin.—In the *Pharmaceutische Zeitung*, 1891, 741, Dr. Hoffmann gives results of several processes for the purification of tuberculin. The crude tuberculin (1 gm.) is slowly dropped into 20 gms. absolute alcohol and the white precipitate coagulated by addition of 0·1 gm. sodium chloride dissolved in 1 gm. water; after 24 hours it separates as a yellowish-brown resinous mass, which is rinsed three times with alcohol (99 per cent.) and then dissolved in 2 gms. water. This solution reprecipitated by addition of 40 gms. absolute alcohol and sufficient tartaric acid added to impart a slight acid reaction (all alkaloidal tartrates being soluble in alcohol, this procedure was adopted to remove alkaloids from the tuberculin); after 24 hours the clear supernatant liquid was decanted and the precipitate washed three times with alcohol; by dissolving in water and evaporating in a desiccator a white amorphous powder was obtained (9 per cent. of the tuberculin taken), which dissolved clear in water after adding a small quantity of sodium carbonate. This product marked A was compared with the purified product of Klebs B (Am. Journ. Pharm., 1891, 599), also with the crude tuberculin C towards reagents. All three show the biuret test and are precipitated by picric acid and ferric acetate; C gives more decided precipitates than either A or B with phospho-molybdic acid, tannin and mercuric chloride; C gives precipitates not obtainable with A and B with potassium tri-iodide, platinic chloride and Mayer's reagent; with Millon's reagent A and B form whitish flakes becoming yellow on warming; C gives the same precipitate, and in addition a supernatant liquid that becomes cherry-red after warming. In all cases where differences were noticed between

the crude and purified tuberculin, the examination of the alcoholic mother-liquors disclosed the substance causing the difference.

Chloroform Pictet.—Experiments made to ascertain the action of direct sunlight on this article proved that in the absence of alcohol it did not change by exposure for three days; in the presence of alcohol (one per cent.) it withstood change for thirty days, although tested under most unfavorable conditions (exposure to the sun during June and July). An examination of the impurities removed in the manufacture of this chloroform (Am. Jour. Pharm. 1891, 346) is in progress. Comment has been made upon the practice of the manufacturer to add alcohol to this purified article, but this is to meet the requirements of the German Pharmacopœia; the alcohol used is also very carefully purified. The results obtained according to Dr. R. du Bois Reymond are very satisfactory.—Dr. Thilo, *Pharm. Centralhalle*, 1891, 657 and 663.

Thilanin is a preparation made by the action of sulphur upon lanolin; it is intended to replace thiol and ichthyol in dermal practice. It contains 3 per cent. sulphur and forms a brownish, unctuous mass having a sulphur odor. It is introduced by Jaffé and Darmstädter.—*Pharm. Centralhalle*, 1891, 678.

New medicinal soaps recommended by Eichhoff are: 1. Menthol-soap 5 per cent., useful in pruritus; 2. Salol-soap 5 per cent., useful in obstinate cases of eczema and psoriasis; 3. Aristol-soap 20 per cent., also serviceable in the above skin-diseases. All of these soaps should contain an excess of fat so as to prevent decomposition of the medicinal ingredients.—(*D. Med. Ztg.*) *Pharm. Centralhalle*, 1891, 679.

Estimation of alkaloids in extracts.—Extract of Nux Vomica: 2 gm. of the triturated extract are agitated with 5 cc. water of ammonia, 5 cc. water and 10 cc. alcohol until solution is effected; the solution is then shaken with three portions of chloroform, 20 cc., 10 cc and 10 cc. The united chloroform solutions are evaporated or the chloroform distilled off, the residue warmed upon a water-bath for several minutes with 15 cc. $\frac{n}{10}$ hydrochloric acid, then filtered and the filter thoroughly washed. The filtrate is titrated with $\frac{n}{100}$ alkali using cochineal as the indicator; if the number of cc. alkali be subtracted from 150 (corresponding to 15 cc. $\frac{n}{10}$ acid) and the remainder multiplied by 0.00364 (assuming that the alka-

loids are present in equal amounts) the product will represent total alkaloids present in 2 grams extract; multiplying this by fifty will give the percentage.

Extract of Belladonna, Aconite, Hyoscyamus, etc.—2·5 grams extract are dissolved in 3 cc. alcohol and 6 cc. water; the solution is rendered alkaline by addition of 1 cc. water of ammonia and then agitated with three portions of chloroform, 20 cc., 10 cc. and 10 cc.; after distilling off the chloroform, the residue is warmed upon a water-bath for a few minutes with 5 cc. $\frac{n}{10}$ hydrochloric acid, filtered, the filter washed with water, and the filtrate titrated with $\frac{n}{100}$ alkali (cochineal as indicator). By subtracting the number of cc. necessary to neutralize from 50 (corresponding to the 5 cc. acid) and multiplying the remainder by the following factors, the weight of alkaloid in 2·5 gm. is ascertained: for atropine and hyosciamine, 0·00289; for aconitine, 0·00533.

Extracts containing Chlorophyll.—5 gm. extract are dissolved in 50 cc. dilute alcohol, a slight excess of baryta water added, diluted to 150 cc.; after standing the supernatant liquid is filtered, the excess of baryta in the filtrate is precipitated by a current of carbon dioxide; after filtering, 75 cc. (representing 2·5 gm. extract) are evaporated to a syrupy consistence and dissolved in a mixture of 6 cc. water, 3 cc. alcohol and 1 cc. water of ammonia; the solution is extracted with three portions of chloroform, etc., as above.

Dry extracts containing powdered glycyrrhiza.—5 gm. extract are exhausted with 100 cc. diluted alcohol; to 80 cc. filtrate a slight excess of baryta water is added and diluted to 150 cc.; after clearing the supernatant liquid is filtered, the excessive baryta removed from the filtrate with carbon dioxide, again filtered and 75 cc. filtrate (representing 2·5 gm. extract) extracted with three portions of chloroform etc., as above.

It is claimed for these methods that all the alkaloid is extracted by the chloroform in the presence of alcohol, and that the emulsifying is avoided by the presence of the dilute alcohol.—Prof. H. Beckurts; Apoth. Ztg., 1891, 537.

Oil of cloves.—The value of this oil depending upon the quantity of eugenol present, H. Thoms proposes the following method of assay depending upon the formation of benzoyl-eugenol (see Am. Jour. Pharm., 1891, 406): 5 gms. of the oil, 20 gms. solution of

sodium hydrate (15 per cent.) and 6 gms. benzoyl chloride are placed in a tared beaker of 150 cc. capacity and thoroughly mixed, this causing the mixture to become quite hot; after cooling 50 cc. water are added, and heat applied until the crystalline mass melts, and again allow to become cold; the clear liquid is run through a weighed filter (dried at 101° C.), and the same operation of washing the crystals repeated twice with 50 cc. water. To remove the sesqui-terpene, which may contaminate the benzoyl-eugenol, the crystals have to be washed with alcohol; this is effected by adding to the still moist crystalline mass in the beaker 25 cc. alcohol of 90 per cent., warming until solution is effected, rotating the solution until the crystals begin to separate again, then allowing the contents of the beaker to cool to 17° C., transferring to the weighed filter and washing with a little 90 per cent. alcohol until the filtrate measures 25 cc; the filter with contents is then at once transferred to the beaker, dried at 101° C. and weighed. To the weight of the benzoyl-eugenol must be added 0·550 gm., the amount soluble in 25 cc. 90 per cent. alcohol; this weight, multiplied by 164 (the molecular weight of eugenol) and divided by 268 (the molecular weight of benzoyl-eugenol) gives the amount of eugenol in 5 gms. oil; for the percentage multiply again by twenty.

An examination of sixteen samples showed the eugenol to vary from 76·87 per cent. to 90·64 per cent.; the oil distilled from the stems was found (contrary to expectations) to contain a high percentage of eugenol, 83–85 per cent.; the specific gravity of the oil was not found to agree with the percentage of eugenol as the following show: 1·059 = 83·2 per cent.; 1 065 = 80·89 per cent.; 1·065 = 82·77 per cent.; 1 0615 = 84·10 per cent.; 1·0655 = 90 64 per cent.; 1·061 = 81·18; this led to the belief that there must be a third constituent present in the oil, for if there were only eugenol and sesquiterpene, the specific gravity should vary in accordance with the percentage of eugenol.—*Pharm. Centralhalle*, 1891, 589.

ABSTRACTS FROM THE FRENCH JOURNALS.

TRANSLATED FOR THE AMERICAN JOURNAL OF PHARMACY.

Estimation of fats in Vaselin.—Messrs. Vizern and Nicolas (*Jour. de Pharm. et de Chim.* 1891, II, 49) for this purpose use the following reagents: (1) Titrated sulphuric acid (2) A solution

of potassium hydrate (from alcohol) 20 gm. in 100 cc. alcohol of 90 per cent. which has been volumetrically tested (·1 cc. = ·0047 K_2O). (3) A solution of phenolphthalein 1 cg. in 500 cc. alcohol of 90 per cent. to which is added sufficient potassium hydrate to produce a slight rose color. The method of using is as follows: To 10 grams vaselin in a porcelain capsule are added 10 cc. of solution No. 2. The mixture is heated on a water-bath under constant stirring for eight minutes; then 50 cc. of No. 3 are added and heated close to the point of boiling. The titrated sulphuric acid is then added, drop by drop, until the mixture becomes colorless. The number of cc. of sulphuric acid used is subtracted from the number of cc. necessary to neutralize 10 cc. of the potassium hydrate solution and the difference multiplied by ·0047 which gives the amount of K_2O used. The further calculation is by using the equation $n : x :: 1{\cdot}635 : 10$, where n represents the quantity of potash absorbed. The result is then multiplied by 10 which gives the percentage of impurities present. The number 1·635 (grams) represents the amount of K_2O necessary for decomposing 10 grams of the fats.

Analysis of Woman's Milk.—H. Wartha (*Ann. di Chim. e di Farmacol.* xiii, 1891, 179) analyzed the milk of 25 women, ranging in age from 18 to 40 years, with the following results:

	Mean.	*Minimum.*	*Maximum.*
Specific Gravity, . . .	1·03276	1·02903	2·03633
Fat, ...	33·5	10·00	48·90
Lactose, ...	70·05	3·20	75·70
Albuminoids, ...	17·96	12·60	22·30
Ash, ...	2·01	1·40	2·80
Water, ...	876·13	862·20	971·90

Pillcoating with Salol.—Dr. Ceppi recommends that pills, which should be disintegrated in the intestines, be coated with salol, as this is dissolved by the alkali which is always present there. Yvon (*Progrès médical*, Aug. 15, 1891), publishes the following formula for this coating: Salol, 2 gm., tannin, 5 dgm., ether of 50°, 10 gm. This is applied in the same manner as the coating with balsam of tolu.

Antisepsis of the Intestinal Canal.—Dujardin-Beaumetz (*Nouveaux Remèdes*, 1891, 497), uses the following for this purpose: Salol, bismuth salicylate, sodium bicarbonate of each, 10 gm., to be divided into 30 cachets, and one to be taken before breakfast and dinner.

Salol.—E. Egasse (*Bullet. de Thérapeut.*, 1891, II, 313), in the course of an article on salol gives the following formulas for the exhibition of this agent:

In suspension for children. Salol, ad libitum; gum arabic, 5 gm.; gum tragacanth, 20 gm.; simple syrup, 30 gm.; water, 120 gm. *For intestinal antisepsis* in typhoid fever and in rectal cancer: Salol, 10 parts; olive oil and lime water, of each 60 parts. *For burns:* Potassium carbonate, 1 gm.; olive oil, 10 gm.; zinc oxide and starch, of each 15 gm.; sulphur, 6 gm.; salol, 5 gm.; lanolin, 63 gm. *For contagious impetigo, pustular eczema:* Salol, 3 gm.; ether, 3 gm.; cocaine hydrochloride, 20 cgm.; collodion, 20 gm. *For sore nipples:* Salol, 4 gm.; ether, 4 gm.; collodion, 30 gm.; or in the form of powder, powdered salol and starch equal parts; as ointment, powdered salol, 5 gm; lanolin or vaselin, 30 gm; *Absorbent cotton* may be saturated with an ethereal solution of salol.

Solution of Salicylic Acid.—Barnouvin (Rev. de Thérap., 1891, 580) draws attention to the fact that glycerin is a good solvent of salicylic acid. By heating, glycerin is able to bring into solution $\frac{1}{50}$ of its weight of the acid, the acid not being deposited on cooling. In endeavoring to obtain a more concentrated solution he found that separation takes place on cooling. A glycerin solution of salicylic acid (1 : 100) will stand dilution with water without precipitation. (See Amer. Jour. Phar., 1890, 18, 17.)

Glycerin as dressing for wounds.—J. J. Fiodoroff (*Med. Obozr.*; *Rev. de Thérap.*, 1891), uses glycerin in place of iodoform in dressing wounds and tabulates the reasons for his preference as follows: (1) glycerin produces in external application no disagreeable secondary effects, whether local or general. (2) In suppurating wounds, it diminishes the suppuration, cleanses the granulations, prevents the morbid processes and accelerates the formation of the cicatrix. (3) It acts like a protective layer in cases where mucous membranes have been destroyed. (4) The walls of purulent cavities, under the influence of glycerin, are rapidly altered, healthy granulations making their appearance.

The estimation of phenol, by means of nitric acid, is recommended by L. Carré (*Comp. rend.*, cxiii, 289). Phenol is thereby converted into picric acid, and the amount of the latter is determined by the

intensity of the coloration through comparison with solutions of known strength.

The generation of oxygen by plants has been studied by Henri Jumelle (*Compt. rend.*, cxii, 1462) at very low temperatures and he found that carbonic acid is decomposed at low temperatures, at which respiration has completely ceased, by plants the vitality of which is not affected by a high degree of cold. Thus the assimilation of atmospheric carbonic acid gas is effected in the light at—35° and—40° C. by Picea, Juniperus and other coniferæ, and by lichens like *Evernia Prunastri.*

Compounds of camphor with aldehydes.—A. Haller has found the following process to yield good results (*Compt. rend.*, ciii, 22): Dissolve 15 gm. sodium in a solution of 150 gm. camphor and 400 gm. toluol, allow to cool, pour off the liquid, wash the crystals of sodium camphor with a little benzol, and then heat with 100 gm. toluol and 105 gm. benzaldehyde; after washing with water the oily liquid contains toluol, camphor, borneol, borneol benzoate and *benzal camphor* (dextro); the latter melts at 95° C. Lævocamphor yields lævo-benzalcamphor having identical properties except in behavior to polarized light. A mixture of equal parts of the two is inactive and melts at 78° C. Analogous crystalline compounds have been obtained as follows: *Cuminalcamphor* $C_{20}H_{26}O$, melting point, 62°; *methylsalicylalcamphor*, m. p. 93°; *ethylsalicylalcamphor*, m. p. 65°; *cinnamalcamphor* $C_{19}H_{22}O$, boils at 280 to 290° C.

Reaction of oil of turpentine with manganous salts.—Commercial oil of turpentine, on being agitated with an ammoniacal solution of a manganous salt, acquires a blackish brown color; the reaction is facilitated by the application of heat. L. Crismer (*Bull. Soc. chim.* [3] vi, 25) ascertained that this reaction depends not only upon the presence of hydrogen dioxide, but likewise of a small quantity of a water-insoluble acid, which was produced by the prolonged influence of air upon the oil. The same reaction takes place with pure oil of turpentine, by adding to it a little oleic acid, followed by the manganous solution, and agitating the mixture with air. *Oil of lemon* shows a similar behavior. On distilling the brown oil in vacuo, a resinous residue is left, soluble in chloroform and containing manganese and formic acid, the latter apparently produced by the oxidation of the terpene. This behavior may be used for the detection of oil of turpentine in various mixtures.

ARTIFICIAL MUSK.[1]

By A. Baur.

The artificial musk previously described (Am. Jour. Phar., 1890, 489) was regarded as trinitroisobutyltoluene. It is, however, a derivative, not of isoprimary but of tertiary butyltoluene, owing to the occurrence in the preparation of the hydrocarbon of an intramolecular change, corresponding with that observed by Schramm in the case of the condensation of benzene with isobutyl bromide by the Friedel-Crafts method.

Tertiary butyltoluene is easily obtained by the action of tertiary butyl chloride on toluene in the presence of aluminium chloride. It boils at 185–187°, and agrees in properties with the so-called isobutyltoluene. The *sulphonic acid*, prepared by warming it with concentrated sulphuric acid, forms a *barium* salt $(C_{11}H_{15}SO_3)_2Ba + H_2O$, which crystallizes in white scales, and dissolves sparingly in cold water, but more easily in hot water, and in 50–60 per cent. alcohol. The *sulphonamide*, $C_{11}H_{15}\cdot SO_2NH_2$, crystallizes from water in nacreous scales, and melts at 94–95°. Earlier determinations with the sulphonamide prepared from so-called isobutyltoluene gave 74–75° as the melting point, and this value is always obtained with the freshly-prepared substance; after being kept for some hours, the melting point is found to have risen to and remains constant at 94–95°. The trinitrobutyltoluene formed by the nitration of tertiary butyltoluene melts at 96–97°, and is identical with the product from so-called isobutyltoluene.

Nitrobutyltoluene, $CMe_3\cdot C_6H_3Me\cdot NO_2$, is obtained by slowly adding fuming nitric acid to a solution of tertiary butyltoluene in acetic acid. It is a yellowish oil of a peculiar and slightly unpleasant odor, boils at 160–162° in a vacuum without decomposition, and is readily volatile with steam. On treatment with excess of nitric acid, it is converted into artificial musk.

Dinitrobutyltoluene, $CMe_3\cdot C_6H_2Me(NO_2)_2$, is formed, together with the mononitro- and trinitro-derivatives when tertiary butyltoluene is dissolved in well-cooled nitric acid of sp. gr. 1·5. On distillation with steam, the mononitro-derivative passes over first, and then a mixture of the mononitro- and dinitro-derivatives distils over, leaving a residue of the trinitro-derivative mixed with a very small

[1] Reprinted from Jour. Chem. Soc., 1891, 1464 (*Ber.*, **24**, 2832–2843).

quantity of the dinitro-compound. A separation of the dinitrobutyltoluene can be more easily effected by crystallizing out the greater part of the trinitrobutyltoluene, repeatedly distilling the oil in a vacuum, and collecting the fraction boiling at 224–225°. Dinitrobutyltoluene is a brown oil of very unpleasant odor, and does not solidify in a freezing mixture. On further nitration, it is converted into artificial musk.

Trinitrobutyltoluene (artificial musk), $CMe_3 \cdot C_6HMe(NO_2)_3$, is obtained when tertiary butyltoluene is slowly added in the cold to five times its weight of a mixture of 1 part of nitric acid (sp. gr. = 1·5) and 2 parts of 15 per cent. anhydrosulphuric acid, and the mixture afterwards heated for 8–9 hours on a water-bath. It crystallizes from alcohol in yellowish-white needles, melts at 96–97°, is only very slightly volatile with steam, and has a powerful odor of musk. It is insoluble in water, but it dissolves readily in alcohol, ether, benzene, chloroform, and light petroleum. With naphthalene in alcoholic solution, it forms a compound $2C_{11}H_{13}(NO_2)_3C_{10}H_8$, which crystallizes in large, yellowish scales, melts at 89–90°, and decomposes into its generators on warming with water. Trinitrobutyltoluene is not affected by treatment with alkalis or ammonia, and when warmed with an excess of aniline forms a compound $3C_{11}H_{13}(NO_2)_32NH_2Ph$, which crystallizes from the excess of aniline in compact forms, and melts at 64°. Of the four possible formulæ for a trinitrometabutyltoluene, the author, on these grounds, excludes the three containing two nitro-radicles relatively in the ortho-position, and assigns to artificial musk the remaining formula [$Me : CMe_3 : (NO_2)_3 = 1 : 3 : 2 : 4 : 6$].

Amidobutyltoluene, $CMe_3 \cdot C_6H_3Me \cdot NH_2$, is formed by the reduction of nitrobutyltoluene with tin and hydrochloric acid. It is a colorless oil, of pleasant, cumin-like odor, and boils at 245°. The acetyl derivative, $C_{11}H_{15} \cdot NHAc$, crystallizes from alcohol in lustrous scales melting at 162°, and the benzoyl derivative in small, white needles melting at 167–168°. It is therefore identical with the amido-compound obtained by Effront in 1884, by heating isobutyl alcohol with orthotoluidine hydrochloride at 280–300°, and must contain the amidogen in the para-position relatively to the tertiary butyl radicle.

Amidodinitrobutyltoluene, $CMe_3 \cdot C_6HMe(NO_2)_2 \cdot NH_2$, is obtained when trinitrobutyltoluene in alcoholic solution is reduced with the

theoretical quantity of ammonium sulphide. It crystallizes from alcohol in brownish-yellow needles, melts at 125–126°, and is insoluble in water. The *hydrochloride* crystallizes in brown scales, and on treatment in alcoholic solution with ethyl nitrite, gives a *dinitrobutyltoluene*, which could not be crystallized.

Tertiary butylmetaxylene, $C_6H_3Me_2 \cdot CMe_3$ [$Me_2 : CMe_3 = 1 : 3 : 5$], can be prepared by boiling metaxylene either with isobutyl bromide or tertiary butyl bromide in the presence of aluminium chloride. It is a colorless liquid which boils at 200–202° under 747 mm. pressure, and on oxidation with nitric acid, yields mesitylenic acid, and with chromic acid, trimesic acid. The *trinitro*-derivative, $CMe_3 \cdot C_6Me_2(NO_2)_3$, crystallizes from alcohol in yellowish-white needles, melts at 110°, and has a strong, musk-like odor; the *nitro*-derivative, $CMe_3 \cdot C_6H_2Me_2 \cdot NO_2$, formed by adding fuming nitric acid to a cold acetic acid solution of the hydrocarbon, crystallizes from alcohol in white needles which melt at 85°, and have a cinnamon-like odor.

Butylethylbenzene, $C_6H_4Et \cdot CMe_3$, is formed by the condensation of ethylbenzene and isobutyl bromide in the presence of aluminium chloride, and is separated from the butyltoluene and butylbenzene produced in the reaction by fractional distillation at 200–205°. It resembles butyltoluene in properties, and yields a *trinitro*-derivative, $CMe_3 \cdot C_6HEt(NO_2)_3$, which is more soluble in alcohol than artificial musk, and has a strong musk-like odor.

Among the secondary products of the reaction between pure toluene and pure isobutyl bromide in the presence of aluminium chloride, are butylbenzene, butylxylene, butylethylbenzene, dibutylbenzene, and dibutyltoluene, and these substances are present in the fraction 170–200°, which was formerly used instead of pure tertiary butyltoluene in the preparation of artificial musk.

AFRICAN COPAIBA "SO-CALLED."

By John C. Umney, Ph.C.

During the present year two consignments at least of a copaierous (?) oleo-resin have been exported by the Niger Company from West Africa to the port of London, the produce, it is said, of the district of the Niger basin. The substance has been offered on several occasions as Balsam Copaiba without finding a bidder or purchaser at public auction. The appearance of such an import is interesting, inasmuch as several species of *Copaifera* are known to

be indigenous to tropical Africa,[1] but the information as to the production of oleo-resins by these species is very meagre, the only description of a secretion of economic value being given by Bennett, who describes *Copaifera Guibourtiana*, known by the natives as the "Kobo" tree, as yielding a copal.

Of the closely allied genus *Hardwickia*, the oleo-resin of certain species of which resembles that of the *Copaifera*, as far as I can learn only one African variety is known, viz: *Hardwickia Mannii*,[2] and it is doubted whether even this is not a species of *Copaifera*.

With such scanty botanical information available, and the exact district of their production at present unascertained, it appeared desirable to compare these African oleo-resins with the products of the South American species of *Copaifera*, with the object of determining their relationship or otherwise by physical and chemical characteristics.

The two oleo-resins from West Africa, which I will designate as (A) and (B), were dissimilar in appearance, due probably to a difference in the manipulation of the two samples.

(A) was light brown in color, slightly fluorescent, having an aromatic, somewhat piperaceous odor, a specific gravity of 0·987 at 15° C., and on standing, deposited a quantity of small crystals. It yielded by distillation with steam 37·9 per cent. of a pale yellow essential oil, which, when dried over chloride of calcium distilled at 264–270° C., and had a specific gravity of 0·9173 at 15° C. The oil was readily soluble in petroleum ether and ether (·735), less soluble in pure ether (·720), and only slightly soluble in rectified spirit and glacial acetic acid. The crystals deposited by the oleo-resin were repeatedly crystallized from petroleum ether, and when pure, had a melting point of 124° C. (uncorrected), had a faint yellow color and were distinctly acid in reaction.

(B) was darker in color, more markedly fluorescent, possessed an aromatic, piperaceous, but slightly empyreumatic smell, and on standing, nearly half its bulk separated as an ill-defined crystalline mass. The specific gravity of the oleo-resin, thoroughly mixed, was 1·002 at 15° C.; but after removal of the deposited mass, the fluid

[1] "Pharmacographia" (1874), p. 200; Bentham and Hooker, vol. i, p. 585; De Candolle's "Prodromus," vol. ii, p. 509; Oliver, "Flora of Tropical Africa," vol. ii, p. 313.

[2] Oliver, "Flora of Tropical Africa," vol. ii, p. 316.

portion had a specific gravity of 0·992 at 15° C. It yielded by distillation with steam 40·2 per cent. of a pale yellow essential oil, boiling from 264–270° C. (uncorrected) and having a specific gravity of 0·9188 at 15° C. The oil was readily soluble in petroleum ether and ether (·735), less soluble in pure ether (·720), and only slightly soluble in rectified spirit and glacial acetic acid.

The crystals were purified in the same manner as those from (A) and found to have the same melting point (124° C.), and to be distinctly acid. This melting point is somewhat close to that of a crystalline resin obtained by Flückiger[1] from gurjun balsam (m. p. 126–130° C.), but that body was indifferent, whilst this from the African oleo-resin is markedly acid, distinctly electrical by friction, and appears to resemble in general characters the oxycopaivic acid (melting point about 120° C.) found by Fehling[2] in a deposit from a Para copaiba. From neither of the oils—of specimens (A) and (B)—could crystals be obtained by passing dry hydrochloric acid gas through them, either at normal temperature or immersed in a freezing mixture, as has been stated to be the case by Soubeiran and Capitaine[3] with Maracaibo oil under similar treatment, but they gave reddish-brown fuming liquids, agreeing with the behavior of an oil distilled from Para copaiba by those authors.

I have failed, notwithstanding several attempts, to obtain crystals of a hydrochloride by this method, when operating on the oil obtained from the Maracaibo variety, and in this respect, therefore, my experiments confirm those of Brix,[4] and show that the formation of this crystalline body from pure copaiba oil appears somewhat uncertain.

A ready test proposed by Flückiger,[5] for distinguishing between copaiba and gurjun balsams, and which has been made official in the United States Pharmacopœia, consists in adding to a solution of the balsam in carbon bisulphide a drop of nitric and sulphuric acids previously mixed and cooled, when in the case of gurjun balsam an intense violet color is produced.

On applying this test to samples (A) and (B), in comparison with

[1] *Pharm. Journ.* [3], viii, 725.
[2] *Ann. Ch. Pharm.*; xl, 110.
[3] *Journ. Pharm.*, xxvi, 70.
[4] *Monatshefte*, [2], p. 507.
[5] *Pharm. Journ.* [3], vii, p. 2.

specimens of Maracaibo and Para copaiba, a brownish-red coloration was produced. A sample of gurjun balsam, however, gave a decided and permanent violet.

Neither of the two oleo-resins (A) and (B) lost their fluidity when heated in a sealed tube to 220° C., whilst gurjun balsam similarly treated became quite solid.

That the two African oleo-resins are identical, therefore, admits of little doubt, and their general characteristics resemble in most particulars the South American copaibas, the only commercial varieties with which we have been previously acquainted.

I hope shortly to publish the results of a chemical examination of the crystals and volatile oils obtained from the two African oleo-resins.—*Pharm. Jour. and Trans.*, Dec. 5, 1891, p. 450.

CAMPHOR: METHODS OF GROWTH AND MANUFACTURE IN FORMOSA.

By Edward Bedloe.

[Correspondence of the *Public Ledger*, Nov. 17, 1891.]

The most interesting portion of my district of "Amoy and its dependencies," to use the diplomatic phrase, is the great island of Formosa. The name (the Portuguese adjective for beautiful) is extremely appropriate, for I question if any handsomer or more picturesque scenery can be found upon the globe. The territory is over 200 miles long and 60 wide, and is about as large as England, Scotland and Wales combined. Along its major axis runs a double range of magnificent mountains, several of whose summits are constantly covered with snow. The fertility of the soil is proverbial in the East. At some points the land produces from three to five harvests a year. Besides the best tea in the market, it produces unlimited quantities of camphor, sugar, rice, hemp, oil, oil cake, castor oil, turmeric and valuable woods. It ought to have an mmense commerce with every part of the world, but it has not, which is due to the time-beaten prejudice of its governing classes against foreigners and everything foreign.

Nowhere does the force of this blind prejudice show itself in so large and ruinous an extent as with the trade in camphor and camphor wood. From the earliest times camphor has been a practical necessity to man. Its pleasant perfume, its destructiveness to

insect life and its many remarkable therapeutic virtues have more than earned its great popularity.

In the past twenty years its importance has been multiplied many times by the discovery of celluloid, zylonite and smokeless powders, in all of which it is an essential ingredient. While the camphor tree grows in numberless places, it finds its best development in Japan, and, above all, in Formosa. In the last-named place it is the predominant forest growth. The trees upon the island are to be numbered, not by hundreds of thousands, but by millions. At the present time there is enough camphor in Formosa to supply all Christendom for a century. Yet, notwithstanding these facts, the output of the entire island in 1890 was only about 60 tons!

The camphor expert selects a tree, and scrapes into the trunk in different places, using an instrument resembling somewhat in appearance a rake, with teeth of curved, gouge-shaped edges that cut pulling. This scoops out the wood in little crescent-shaped chips. A tree is not considered to be worth anything for camphor purposes until it is 50 years old. The yield of a tree is unequal, being greater in and about the roots than higher up on the trunk.

The scrapings or chips are pounded in a stone or iron mortar and boiled in a large iron caldron, over which is placed, with the concave side covering the mouth of the caldron, an earthenware bowl-shaped vessel. In the boiling the camphor sublimes and condenses on the inside of the big bowl, which is removed from time to time, the camphor scraped off and replaced.

The root and trunk are scraped while the yield lasts, and the chipping is continued till finally the tree falls. No attempt is made to extract the camphor from the trunk or branches of the fallen tree. In some cases the trunk is sawed up into planks, but this depends upon the locality. In many districts, owing to absence of roads, timber would not pay for its transport. It is impossible to imagine a more wasteful method, and it is fortunate that the camphor forests of Formosa are practically inexhaustible. The quantity of camphor produced depends upon the amount of labor employed in the business. Ten iron pots and accompanying bowls make up what is called a "set," and are worked by four men. One set will produce about six pounds a day; a fair average is 150 pounds a month.

At one time the camphor trade was monopolized by the Governor

of Formosa and his official staff. The annual output ran as high as 250 and 300 tons and netted the distinguished syndicate over $100,000 a year. The profit can be easily appreciated when it is known that the poor peasant was paid four cents per pound for the camphor which was sold a week afterwards in Hong Kong for anywhere from 24 to 35 cents. The monopoly was abolished in 1870 at the intervention of the ministers of all the great powers at Peking. Foreign merchants, especially British and American, prepared to enter the trade on a large scale. The authorities, with characteristic shrewdness, enacted forthwith a likin or internal revenue system which completely frustrated all attempts to do business successfully.

(1) A tax was imposed upon every pot or boiler, no matter whether used full time, half time, or no time at all. As non-payment of a tax in China is a crime punishable by fine and imprisonment, this measure caused the camphor makers to break and destroy one-half of their plant rather than run the risk of going to jail.

(2) A heavy "battery tax" (or an assessment for the building and maintaining of forts in the district) was imposed upon the finished product. This was nominally about three cents per pound, but as levied came to twice that figure.

(3) The barrier imposts (or likin proper) were assessed at from one to two cents a pound upon the article. In instances a donkey load of camphor would be obliged to pass six to a dozen barriers between the point of production and the market place.

(4) An export duty was laid upon the camphor.

(5) A system of terrorization was set on foot by the subordinate officials, which frightened nearly all the camphor growers from selling to the foreign hongs. Under these circumstances the trade languished, and the supply demanded by Europe and America was drawn from Japan and other countries.

In 1885–86 there was a change in the administration of Formosa and a more liberal and progressive set of men came into office. They began their régime with promise of reform, of new laws for the extension and benefit of trade, and of a more generous and equitable treatment of the foreign hongs. The latter were delighted and made contracts with the native merchants and farmers for large quantities, to be delivered at the place of production and to be brought down to the port under the protection of official permits.

The first consignment arrived promptly and cleared a very handsome profit. The merchants were delighted, but their pleasure was short-lived, inasmuch as the new Governor, without a word of warning, re-established the old monopoly. Notwithstanding the contracts then pending between the foreign merchants and the native dealers, contracts upon which large sums had been advanced, the internal revenue and custom house officers seized all the camphor in the market or in transit, permits or no permits. The merchants were thunderstruck and appealed in a body to the British and United States Consular representative at Talwanfoo, Hon. Pelham L. Warren, a brave and brainy gentleman. He made a strong fight against the outrage, put in claims for heavy damages, carried the case to Peking, where he was sustained by the united foreign legations, and afterwards by the highest authority in China, the Jsung-li-Yamen or Imperial Cabinet. The monopoly was expressly abolished, and the claims after tedious delay and litigation, allowed and paid in full to the sufferers.

Before the opportunity thus created could be taken advantage of, the local administration levied a special tax on camphor of one cent per pound, exclusive of the internal revenue and export duty. It was done under the pretext of a "garrison tax," the Government claiming there was danger of an uprising of the savages in the interior of Formosa, and that new regiments had to be raised, equipped and supported. There never was any uprising, there were no troops recruited, but the tax ran gayly along all the same, and the proceeds went into the pockets of those in power. The tax was then raised to two cents per pound as the price of camphor rose in the Hong Kong market, and as this did not change the state of affairs it was again raised, this time to 13 cents per pound. At the same time the camphor growers were warned by threatening proclamations that they were required to pay this tax in advance upon all camphor produced; that any delinquency or mistake would meet with the severest punishment, but that the "camphor farm" (a new form of the old Government monopoly) would pay eight cents a pound to any and all growers for their crop. Up to the time of these last enactments the price of camphor had fluctuated in the country where it is grown from four cents to eight cents a pound. It now rose with a jump to 21 cents. The net return to the buyer was about five cents on an average; the difference went

to the "camphor farm;" that is to say, about one-tenth thereof to the members of the official clique and nine-tenths to the superior officials of Formosa.

This monstrous condition of affairs has remained unchanged up to date. The producers are afraid to deal with the foreign merchants lest they be fined and imprisoned for some technical violation of the law. The merchants are fearful of making contracts which will cause litigation and loss at the hands of the internal revenue and the customs. The trade has, therefore, been steadily falling off, and as the smokeless powders of Europe, made from camphor, have proved to be failures, and are being replaced by explosives in which that substance is not employed, the demand is diminishing from abroad, so that there is every prospect of an utter collapse of the camphor trade and the camphor monopoly of Formosa.

The monopoly is singularly devoid of intelligence. The Chinese never dare to go into the interior, where the savages live, and where the finest camphor can be had at almost no expense.

The savages, strange to say, have a wild love for Europeans or white people, probably because of their hatred for their Chinese enemies, and are willing to supply any amount of camphor on demand. The monopoly, to prevent this source of competition, have had a law passed prohibiting all intercourse or commerce with the aborigines, and even forbidding the tourist to enter the latter's territory. There is at present some prospect of a speedy change. The old Governor has just been removed and a new one is to be appointed. In view of the serious troubles in China, which are forcing the Central Government into more intimate if not more amicable relations with the foreign powers, it is more than probable that the coming appointee will inaugurate a wiser and better policy than that which has prevailed in Formosa during the past five years. If such an event occur there will be a wonderful development in the commerce of that wonderful island. If not, it will sink deeper in the ocean of bankruptcy and pauperism.

AMOY, October 4, 1891.

Aseptic scrubbing brush.—Prof. J. B. Roberts recommends the Egyptian *luffa* for the removal of accumulations of epithelium and bacteria from the skin previous to operation. A piece of the fibrous tissue is used and may then be thrown away; for hospital use such pieces may be kept soaking in sublimate solution until used.—*Med. News*, Nov. 7, 1891, p. 544.

STRYCHNINE.[1]

By J. Tafel.

Investigation has shown that the compound named "strychnol" by Loebisch and Schoop (Am. Jour. Ph., 1888, 564), and previously described by the author as strychnine monhydroxide (1890), is not a phenol, but an imido-acid of the composition $C_{20}H_{22}NO(COOH):NH,4H_2O$; so that it may suitably be named *strychnic acid.* The substance, of the composition $C_{21}H_{26}N_2O_4$, obtained by Gal and Etard (*Bull. Soc. Chim.*, **31**, 98) by heating strychnine with a solution of barium hydroxide at 130°, and named by them dihydrostrychnine, loses 1 mol. H_2O at 135°, and has, therefore, the composition $C_{21}H_{24}N_2O_3 + H_2O$; as it is isomeric with strychnic acid, and, also, gives almost all the reactions of the latter, it may be termed *isostrychnic acid.* Both these acids are formed when strychnine is treated with alcoholic soda at 100° or with barium hydroxide at 140°, but the relative quantity of the two compounds depends, to a very considerable extent, on the temperature at which the reaction is carried out; when, for example, finely-divided strychnine (10 parts) is heated at 50–55° with a solution of sodium (1 part) in alcohol (10 parts), strychnic acid alone is formed; but if the temperature is raised to 70°, the product contains small quantities of isostrychnic acid.

Strychnic acid is completely converted into strychnine when it is heated at 190° in a stream of hydrogen; its other properties have been already described by Loebisch and Schoop. The *nitrosamine hydrochloride*, $C_{20}H_{22}NO(COOH):N\cdot NO,HCl + H_2O$, is obtained when the acid is treated with sodium nitrite and hydrochloric acid in the cold; it crystallizes from alcohol in yellowish prisms, is moderately easily soluble in cold water, and gives the nitroso-reaction; on reduction with zinc-dust and acetic acid, it is converted into a compound which reduces Fehling's solution, but when warmed with tin and hydrochloric acid it yields strychnic acid hydrochloride.

Strychnic acid methiodide, $C_{21}H_{24}N_2O_3MeI + H_2O$, is formed when an aqueous solution of the sodium salt of strychnic acid methiodide is acidified with dilute acetic acid, and also when methylstrychnine is treated with cold hydriodic acid; it loses its water at 120–130°,

[1] *Annalen*, **264**, 33–84; Jour. Chem. Soc., 1891, p. 1262.

and is only very sparingly soluble in cold water and alcohol, and insoluble in ether, but it dissolves freely in alkaline carbonates. It gives a nitroso-derivative on treatment with nitrous acid, and, when boiled with dilute acids, it is converted into *strychnine methiodide*, $C_{21}H_{22}N_2O_2$,MeI + H_2O. The *sodium* salt, $C_{22}H_{25}N_2O_3INa + H_2O$, prepared by heating strychnic acid with methyl iodide and alcoholic soda, or by dissolving the methiodide of strychnic acid in methyl alcoholic soda, crystallizes in long needles, and is very readily soluble in water and methyl alcohol, but only sparingly in boiling alcohol; the corresponding *silver* salt is a colorless, gelatinous, unstable compound.

Methylstrychnic acid methiodide, $C_{22}H_{26}N_2O_3MeI + H_2O$, is obtained by treating an aqueous solution of dimethylstrychnine with hydriodic acid, and, also, together with its methyl salt, by heating a methyl alcoholic solution of the sodium salt of strychnic acid methiodide with methyl iodide. It crystallizes from boiling water in small needles, loses its water at 130°, and is moderately easily soluble in hot alcohol, but insoluble in ether; when treated with a little silver nitrate and concentrated nitric acid, it gives the same blood-red coloration as dimethylstrychnine. The *methyl* salt, $C_{22}H_{25}N_2O_3Me$,MeI, separates from boiling water in short needles, and is only sparingly soluble in alcohol and chloroform and insoluble in ether and benzene; when treated with freshly-precipitated silver oxide, it is converted into a strongly alkaline substance which is decomposed on boiling with formation of dimethylstrychnine.

Methylstrychnine is highly poisonous, and feebly lævorotatory; it gives the same color reactions as strychnic acid. When treated with nitrous acid in aqueous solution, it is converted into a crystalline nitrosamine, and, when boiled with sodium ethoxide, it is transformed into a feeble base of the composition $C_{24}H_{30}N_2O_3$; this substance crystallizes from boiling alcohol in small needles, melts at 158°, and is very readily soluble in benzene, chloroform, and glacial acetic acid, but almost insoluble in water.

A *nitroso*-derivative is obtained as a yellow precipitate when dimethylstrychnine is treated with amyl nitrite in alcoholic hydrochloric acid solution; it is a semi-crystalline, very deliquescent powder, and when dried at 100° in an atmosphere of hydrogen, it has the composition $C_{23}H_{29}N_3O_4Cl_2$.

Isostrychnic acid, $C_{20}H_{22}NO(COOH):NH + H_2O$, is best prepared

by heating strychnine (100 grams) with crystalline barium hydroxide (150 grams) and water (800 grams) at 135–140°, then filtering from unchanged strychnine, and saturating the hot filtrate with carbonic anhydride; the acid is extracted from the precipitated barium carbonate with dilute soda. The anhydrous compound is very hygroscopic, and takes up 1 mol. H_2O on exposure to the air; it resembles strychnic acid very closely, than which, however, it is rather more sparingly soluble in water. It gives the same color reactions as strychnic acid, even after it has been boiled with acids, and it is not changed by boiling concentrated hydrochloric acid; it forms an oily acetyl derivative and an oily ethyl salt, and is highly poisonous. The *hydriodide*, $C_{21}H_{24}N_2O_3,HI + 2H_2O$, crystallizes in well-defined prisms and loses 1 mol. H_2O over sulphuric acid in a vacuum, the other being expelled at 110°; it is readily soluble in hot water, but only sparingly in cold water and alcohol, and insoluble in ether. The *nitrosamine hydrochloride*, $C_{21}H_{23}N_3O_4,HCl + 2H_2O$, crystallizes from hot alcohol in needles, and is readily soluble in warm water, but insoluble in ether; it is decomposed by boiling water, gives Liebermann's reaction, and, when warmed with tin and hydrochloric acid, is decomposed, with formation of strychnine.

Isostrychnic acid methiodide, $C_{21}H_{24}N_2O_3,MeI$, can be prepared by treating the sodium salt (see below) with dilute mineral acids, or by the action of hydriodic acid on an aqueous solution of isomethylstrychnine; it separates from hot water in crystals, is only sparingly soluble in alcohol, and insoluble in ether; when treated with nitrous acid, it yields a resinous nitroso-derivative. The *sodium* salt, $C_{22}H_{25}N_2O_3INa + H_2O$, obtained by warming isostrychnic acid with methyl iodide and sodium methoxide in methyl alcoholic solution, crystallizes from hot alcohol in microscopic needles, and is readily soluble in water.

Methylisostrychnic acid methiodide, $C_{22}H_{26}N_2O_3,MeI + H_2O$, is obtained, together with its methyl salt, by heating the sodium salt of isostrychnic acid methiodide with methyl iodide in methyl alcoholic solution, or by treating isodimethylstrychnine with hydriodic acid; it crystallizes from boiling water in needles, loses its water at 130°, melts at 270–285° with decomposition, and is moderately easily soluble in hot alcohol, but insoluble in ether, chloroform and benzene. The *methyl* salt, $C_{22}H_{25}N_2O_3Me,MeI + 2H_2O$, crystallizes from boiling water in long needles, loses its water in a vacuum, and

is very sparingly soluble in alcohol, and insoluble in ether and benzene; when treated with freshly-precipitated silver chloride, it is converted into the corresponding *methochloride*, $C_{22}H_{25}N_2O_3Me$, $MeCl + 2H_2O$, which crystallizes in long, colorless needles.

Isomethylstrychnine, $C_{22}H_{26}N_2O_3 + 7H_2O$, is formed when an aqueous solution of isostrychnic acid and methiodide is treated with silver oxide, first at the ordinary temperature and then at 100°; it crystallizes from hot water in small, colorless needles, and is very readily soluble in alcohol and hot water, but insoluble in ether and benzene; it yields a crystalline nitrosamine, and it gives the same reaction with dilute sulphuric acid and potassium dichromate as methylstrychnine, even after having been boiled with dilute acids.

Isodimethylstrychnine, $C_{23}H_{28}N_2O_3 + 3H_2O$, prepared from methylisostrychnic acid methiodide in like manner, or from the methylhydroxide of methyl methylisostrychnate, as previously described in the case of dimethylstrychnine, separates from hot water in well-defined crystals, and is readily soluble in alcohol, but insoluble in ether; it gives the same reactions with oxidizing agents and with nitrous acid as dimethylstrychnine.

The author's experiments have shown that the so-called hydrates of strychnine are isomeric imido-acids, that strychnine is an inner anhydride of strychnic acid, and that methyl and dimethylstrychnine are betaïne-like derivatives of this acid; the nitrogen atom in the $-CO-N=$ group in strychnine is in direct combination with one benzene nucleus.

BENZOYLPSEUDOTROPEINE, AN ALKALOID OF JAVA COCA-LEAVES.[1]

By C. Liebermann.

The alkaloid was obtained in the form of its hydrobromide from Dr. Giesel, and was purified by extraction with ether and crystallization from boiling water.

Benzoylpseudotropeine hydrobromide, $C_8H_{14}NOBz,HBr$, crystallizes in beautiful, long leaflets, and is soluble in water and alcohol.

Benzoylpseudotropeine, $C_8H_{14}NOBz$, is obtained by decomposing the above salt with sodium carbonate and extracting with ether. On evaporating off the ether, it is obtained as an oil which solidifies

[1] *Berichte*, **24**, 2336–2345; Jour. Chem. Soc., 1891, p. 1263.

in radiating crystals. It melts at 49°, reacts strongly alkaline in alcoholic solution, is easily soluble in alcohol, ether, chloroform, benzene, and light petroleum, and is optically inactive. The *hydrochloride*, obtained by passing hydrogen chloride into an ethereal solution of the base, crystallizes in white needles, and melts at 271°. The *platinochloride* is obtained as a flesh-colored precipitate, and is insoluble in water, alcohol and ether. The *aurochloride* crystallizes from water in beautiful, yellow needles, melts at 208°, and is sparingly soluble. Mercuric chloride causes a crystalline precipitate when added to a solution of the hydrochloride. Picric acids give a sparingly soluble precipitate, crystallizing in yellow needles.

When the above base or its salts is heated with hydrochloric acid in a reflux apparatus for some hours, it is completely decomposed into benzoic acid and pseudotropine.

Pseudotropine, $C_8H_{15}NO$, is obtained from the products of hydrolysis of the above base after the benzoic acid has been extracted with ether. The acid solution is evaporated to dryness, and the hydrochloride either decomposed with silver oxide or excess of strong sodium hydroxide is added, and the base extracted with ether. It has a strongly alkaline reaction, crystallizes in beautiful needles, melts at 106–107°, boils at 240–241° (corr.), and is easily soluble in water, alcohol, and benzene, and is precipitated from the latter solvent by light petroleum. The base is, no doubt, identical with Ladenburg's pseudotropine, although the aurochloride melts at 225°, whereas Ladenburg's melted at 198°. The *hydrochloride* crystallizes in needles, is somewhat hygroscopic, and easily soluble in alcohol. The *aurochloride* crystallizes from water in beautiful, yellow needles, and is easily soluble in alcohol and hot water. The *platinochloride*, when first prepared, is so soluble that it is necessary to evaporate the solution almost to dryness before crystallization takes place; the crystallized salt is, however, difficult to dissolve in water, and is precipitated on the addition of alcohol. Pseudotropine hydrochloride yields, with mercuric chloride, a white precipitate; with picric acid, an easily soluble salt, crystallizing in yellow needles.

The author has synthesized benzoylpseudotropeine by heating pseudotropine (3 grams) with water (1·5 grams) and benzoic anhydride (1¼ mols.) on the sand-bath for 1¼ hours at the boiling point of the mixture. The synthetical base is entirely similar to the natural one.

The author has no doubt that a series of pseudotropeines, corresponding to the tropeines, can be prepared from pseudotropine. He has prepared the following:

Cinnamylpseudotropeine, $C_8H_{14}NO(C_9H_7O)$, is obtained from pseudotropine and cinnamic anhydride, melts at 87–88°, and is very easily soluble in cold alcohol, ether, and benzene, somewhat less so in light petroleum. The *hydrochloride* is obtained as a white, crystalline precipitate on passing hydrogen chloride into an ethereal solution of the base, and is easily soluble in alcohol and water. The picrate, platinochloride, and aurochloride are similar to those of benzoylpseudotropeine.

THE EXISTENCE OF A MYDRIATIC ALKALOID IN LETTUCE.[1]

By T. S. Dymond.

From the Research Laboratory of the Pharmaceutical Society of Great Britain.

The attention of the author was drawn a few months ago to the mydriatic action of an extract prepared at Hitchin from common lettuce, *Lactuca sativa*, when in flower. On examination, the mydriatic action was found to be due to an alkaloid. The extract closely resembled belladonna extract in appearance, smell and taste; but a dose of 5 grains had been without injurious effects. Three other commercial extracts of lettuce were examined, viz: an extract of wild lettuce, *Lactuca virosa*, prepared according to the directions of the British Pharmacopœia, the history of which was unknown, and extracts of both the wild and the cultivated lettuce, prepared at Market Deeping, in Lincolnshire. An extract of that variety of the cultivated plant known as Cos lettuce was also examined. They all contained an alkaloid which had a very marked power of dilating the pupil of the eye. Finally, a dried specimen of wild lettuce, collected when in flower, was examined. It contained a mydriatic alkaloid.

The impure alkaloid obtained from the extract was a light brown syrup, which possessed powerful mydriatic properties. In order to purify it, it was converted into the oxalate. The alkaloid recovered

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[1] The substance of a communication made to the Chemical Society on December 3d; reprinted from *Pharm. Jour. and Trans.*, Dec. 5, 1891, p. 449.

from the pure oxalate, when crystallized from chloroform, closely resembled hyoscyamine, both in appearance and in melting point. The aurochloride was then produced by the usual methods, and this, after recrystallization, was obtained in the shining flat needles characteristic of the aurochloride of hyoscyamine. The estimation of the gold and the base in this compound showed that the alkaloid was one of three isomeric mydriatic alkaloids having the formula $C_{17}H_{23}NO_3$, while its melting point was 159·75° (corr.), and closely corresponded with that ascribed by Ladenburg to the aurochloride of hyoscyamine. The plant does not appear to contain a second mydriatic alkaloid, although it must be remembered that only small quantities of material were operated upon.

The author has thus shown that both wild and cultivated varieties of lettuce, especially when the flowering stage is reached, contain hyoscyamine, the mydriatic alkaloid occurring in *Hyoscyamus niger*, *Atropa Belladonna* and other plants belonging to the natural order *Solanaceæ*, and it is probable that to the presence of this alkaloid the sedative and anodyne properties of extract of lettuce are due.

That this important constituent has been until now overlooked, is probably due to the fact that in chemical investigations upon lettuce, the dried milk sap, lactucarium, has alone been examined, although its value as a sedative and anodyne is by no means established. The author found that lactucarium of both English and German manufacture was devoid of mydriatic properties and contained no alkaloid whatever.

The fact that lettuce contains a poisonous alkaloid is not of great importance in connection with its use as a vegetable, since it is only used for this purpose in the early stages of its growth, before the bitter milk has been produced, when the hyoscyamine is only present, if at all, in minute quantities. The amount of mydriatic alkaloid in the extract prepared from garden lettuce when in flower is not more than ·02 per cent. Nevertheless, cases have been recorded in which the immoderate consumption of lettuce has led to unpleasant and even fatal results. Lettuce belongs to the natural order *Compositæ*. This is the first occasion on which hyoscyamine has been found in plants not belonging to the natural order *Solanaceæ*.

The author's thanks are due to Messrs. W. Ransom & Son and to Messrs. Wright, Layman and Umney for furnishing him with specimens and information.

EXAMINATION OF CHINESE TEA.[1]

By P. Dvorkovitch.

The author criticizes the methods of Peligot, Mulder, and Zöller for the estimation of theine in tea, and, regarding them as unsatisfactory, has devised the following process, which is said to be both rapid and exact. Ten grams of the finely powdered tea is treated with three successive quantities of 200 cc. of boiling water, five minutes being allowed for each digestion, and then boiled with two successive quantities of 200 cc. of water, or more, if necessary, until the last extract is almost, if not quite, free from color. The extracts are made up to a litre, and extracted thrice with light petroleum to remove oil, etc.; 600 cc. of the washed solution is then shaken with 100 cc. of baryta-water containing 4 grams of baryta in solution, filtered, and 583 cc. of the filtrate (corresponding with 5 grams of tea) mixed with 100 cc. of salt solution (20 grams of salt in 100 cc. of water), and thrice extracted with chloroform. The extraction is best effected by shaking successive small quantities of the solution with chloroform, since nothing further can be extracted from the solution after the third shaking under these conditions, and not more than 400 grams of chloroform is required. After removal of the chloroform, by distillation to a small bulk and subsequent evaporation in a small dish and drying at 100°, the theine is obtained in perfectly white needles.

In the preparation of black tea the leaves are submitted to a fermentation, which has a most important influence on the quality of the product, and, as Geissler has shown, is carried on at the expense of the tannin. With the object of estimating not only the tannin but also the decomposition products formed from it during the fermentation, or, in other words, determining the extent of the fermentation, the author has improved Löwenthal's method of oxidation with potassium permanganate in the presence of indigo-carmine. The solutions required are the following: (1) Decinormal oxalic acid; (2) a potassium permanganate solution of such a strength (approximately 2·6 grams in the litre) that 130 grams are equivalent to 100 grams of decinormal oxalic acid; (3) dilute sulphuric acid containing 200 grams of ordinary acid to a litre of water; (4) baryta-water containing 4 grams of baryta to 100 cc. of

[1] *Berichte*, **24**, 1945–1955; reprinted from Jour. Chem. Soc., 1891, p. 1302.

water; and (5) an indigo-carmine solution prepared by mixing 50 grams of pure indigo-carmine paste with water, adding 50 grams of sulphuric acid and a litre of water, filtering, and diluting until 25 cc. of the solution require 20 cc. of the permanganate for oxidation. The tea solution (10 grams in the litre) is prepared as already described, and of this 40 cc. is diluted with 500 cc. of water, treated with 25 cc. of the indigo-carmine solution and 25 cc. of dilute sulphuric acid, and titrated with permanganate until the yellow color becomes evident. The manner in which the permanganate is added is of considerable importance, and the author states that in the titration of the indigo-carmine solution, 18 cc. of the permanganate is added at the rate of 2–3 drops per second, and the remainder at the rate of 1 drop per second, and that in the titration of the tea with indigo-carmine, 23 cc. of the permanganate is run in first of all, then 2–3 drops per second is added, and finally only 1 drop per second until the reaction is completed. If more than 38 cc. of permanganate is required in the latter titration, a smaller quantity of the tea solution should be taken for the analysis. The amount of the fermentation product is then estimated. For this purpose, 80 cc. of the tea solution is mixed with 20 cc. of baryta-water, filtered, and 50 cc. of the filtrate corresponding with 1/25th of the tea extract is diluted with 500 cc. water, mixed with 25 cc. of dilute sulphuric acid, then with 25 cc. of the indigo-carmine solution, and titrated with permanganate, 18 cc. of the solution being run in, first of all, then 2–3 drops per second added, and finally 1 drop per second until the reaction is ended. The amount of permanganate employed, less that required for the oxidation of the indigo-carmine, indicates the amount of decomposition products of tannin, or, more correctly, the degree of fermentation which the tea-leaves have undergone. The percentage of tannin and of the fermentation product is calculated by multiplying the weight of oxalic acid equivalent to the number of cc. of permanganate employed in the oxidation, by 31·3, since 63 grams of oxalic acid, according to the author's experiments, correspond with 31·3 grams of tannin, and not with 41·2 grams as stated by Neubauer.

With regard to the comparative values of teas, the author states that the higher the proportion of theine to the total amount of tannin and fermentation products, the more valuable is the tea. The analyses of teas of the first crop of 1890 are quoted in the paper,

and gave the following results: Water, 7·44–9·78; theine, 2·14–3·45; tannin, 8·84–10·55 · fermentation products, 0·90–1·88; extractive matter, 30·70–34·95.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, December 15, 1891.

Mr. Chas. W. Hancock presided. The minutes of the last meeting were read, and no corrections being required, they were approved.

A friend of the college presented a fine steel engraving of the late Professor Justus Liebig.

A paper, written by A. L. Beck, Ph. G., upon the *preservation of syrup of ferrous iodide*, by replacing atmospheric air with carbonic acid gas, was read; it was accompanied with photographic illustrations of the apparatus. Several members called attention to various methods that had been used for the same purpose, such as glucose, hypophosphorous acid, a coil of iron wire, etc.

A formula for *Elixir of Yerba santa*, which was inquired for at the last meeting, was given by Mr. T. H. Strouse. Formulas were also given for *Liquor Carbonis detergens* and for several other preparations, which are occasionally called for.

A paper upon the *presence of copper in galenical preparations* was read by F. W. Haussmann, Ph.G., and gave rise to considerable discussion.

Mr. England said that it was well known that copper utensils were those most commonly employed in manufacturing establishments. This, it is to be presumed, is in consequence of their superior durability, and as copper in even minute doses is known to affect the animal economy, it is a matter well worthy of inquiry whether the use of some of the remedies employed may not produce effects which seriously embarrass the medical practitioner to explain; and as there is no rule which the commercial manufacturer conforms to but commercial success, it is a strong argument in favor of the apothecary being his own factor in all possible cases. The test for copper in such preparations is quite easy; a perfectly bright clean steel spatula kept for a short time in any extract containing it in appreciable quantities. Certain classes of extracts are less likely to contain it than others; those which contain tannin will have but little, as it is likely to be precipitated with the tannin, but if this precipitate be mixed up with the supernatant fluid, it will be more easily perceived.

D. C. B. Lowe, Ph.G., read a paper on *conveniences in the pharmacy*, pointing out a number of practical matters which facilitate the work of the apothecary.

Jos. W. England, Ph.G., read a paper upon the *medicinal use of oxygen*, and exhibited the apparatus which was used in the Philadelphia Hospital for its preparation and purification; perfect freedom from impurities, especially acids, must be insisted on.

A specimen of *colchicein* was exhibited by the kindness of Mr. C. Bullock.

A paper upon *Creasote pills*, by J. C. Roberts, Ph.G., was read by Mr. England. Several confirmed the value of the method adopted. Professor Maisch stated that good results could also be obtained by combining the creasote with some solid fat or wax and adding a vegetable powder.

C. Carroll Meyer, Ph.G., sent a paper upon a simple method of *dispensing liquids in capsules.* A model of the apparatus was exhibited by Mr. England.

Dr. Lowe alluded to a prescription calling for arsenic and strychnine, with several drops of an essential oil; it was dispensed by forming a mass of the arsenic and strychnine, dividing it, placing each pill into a capsule, then dropping the oil into each capsule and closing it up.

A paper upon a new mode of *administering iodine* was read by Mr. England. Professor Maisch stated that this method of combining iodine with sugar had been recommended about thirty years ago The papers were, on motion, referred to the committee on publication, and after calling attention to some curious latinized prescriptions, a motion to adjourn was carried.

T. S. WIEGAND, *Registrar.*

EDITORIALS.

The new volume of the Journal, beginning with the present number, will make the sixty-fourth of its uninterrupted issue, and the twenty-second under the editorial management of the present editor. What the "Journal" has been in the past, has been placed on record; that this record shall not be dimmed will be the continued aim of the editor, who extends his sincere thanks to the friends and contributors for the many courtesies extended in the past, which, he trusts, will be continued; and it is hoped that the circle of usefulness, upon which the "Journal" can look, will be enlarged through the enlistment of the good-will and favor of many new friends.

The valuable information which is contained in the volumes issued has been made readily available through three indices, one being a *general* index, closing with the year 1870, and two *decennial* indices, closing respectively with 1880 and 1890, the latter having been issued during the past month, and all three being obtainable, at moderate prices, from the business editor. These indices deserve to be consulted by investigators and authors, the more so, since for a long period the progress of pharmacy in North America was recorded almost exclusively in the pages of the American Journal of Pharmacy.

The Philadelphia College of Pharmacy, on various occasions, invited its members and friends to a social reunion, among others, with the view of inspecting the introduction of electric lights into the college building a year ago. We then reported that many of those present on that occasion expressed the wish that such social gatherings take place more frequently in the future than had been the case in the past. Such a reunion was again held on the evening of Tuesday, December 29th, and the arrangements by the efficient committee of the preceding year were made in such a manner as to give promise of a large attendance, and to those participating, of an enjoyable evening. The latter proved to be the case, but unfortunately a violent wind and rain storm prevailing the greater part of the day until after midnight, interfered with the attendance. Several members from a distance were present, and all enjoyed the remarks made by Professor Sadtler in explaining the lantern views of interesting German and Swiss scenery; the microscopic exhibition arranged by A. P. Brown, Ph.G.; the inspection of the new Beindorf apparatus procured for the pharmacy lecture room; the collation and the music provided in the museum, and the conversational intercourse with those present.

Hospital Stewards of the United States Army.—Under date of December 15, 1891, a circular has been issued by Surgeon-General C. Sutherland, with the view of giving information to persons who may be desirous of enlisting in the hospital corps of the army. The facts and rules explained in the circular not being generally known, or known only to a very limited extent, we make room for the entire circular, which is as follows:

The Hospital Corps of the Army consists of privates, privates assigned as acting hospital stewards, and hospital stewards. A number of vacancies occur in these grades from time to time, which may be filled by enlistment from civil life and subsequent promotion.

Applicants for enlistment must be between the ages of eighteen and thirty years, unmarried, of good character and habits, able-bodied and free from disease. Such minor defects of vision as may be corrected by glasses are not regarded as a bar to enlistment.

All enlistments are for the grade of private; but provision is made for the speedy promotion of those who show themselves to be earnest, intelligent, capable and trustworthy.

The term of service is five years; but it may be terminated earlier if the individual is desirous of returning to civil life. Under the Act of June 16, 1890, and existing rules prescribed by the President in accordance therewith, a soldier in his first enlistment, after having served one year, may purchase his discharge for $120, with a reduction of $5 in the purchase price for every subsequent month until he completes three years of service, when, if he has served honestly and faithfully, he is entitled to a furlough for three months with pay and the privilege of discharge at the expiration of the furlough.

The pay of the hospital steward is $45 per month, of the acting hospital steward $25, and of the private $13.

From the pay of the first year as given above, $4 per month is retained; but this retained money, together with $1 per month for the third year of enlistment, $2 per month for the fourth year, and $3 per month for the fifth year, *in addition to the rates enumerated above*, will be paid to the soldier upon discharge provided he has served honestly and faithfully. The sums thus retained will be treated as deposits upon which interest at the rate of four per cent. per annum will be paid from the end of the year of the soldier's enlistment in which they accrued.

As regards the pay of the private the Surgeon-General has recommended that it be increased to $19 per month; and it is hoped that favorable action will be taken by the Secretary of War and Congress on this recommendation.

In addition to their pay, members of the Hospital Corps receive from the Government quarters, rations, clothing, bedding, etc. The money allowance for clothing is such that with care a considerable sum may be saved to be added to that which is paid on discharge.

The accepted candidate for enlistment is attached at first to one of the companies of instruction at Fort Riley, Kansas, or Fort D. A. Russell, Wyoming. He is there taught by practical demonstrations and recitations the knowledge that is needful to enable him to do his duty intelligently as a sanitary soldier, and to appreciate what are the requisites for promotion in the corps. When properly qualified by this course of instruction the recruit is sent to some military station for duty.

Privates who have served one year or more and who have displayed particular merit are recommended to the Surgeon-General for assignment to duty as acting hospital stewards. A material increase of pay, as already stated, is attached to these appointments.

Graduates in pharmacy are eligible for these positions after a service of six months to familiarize them with military drill, discipline, and the methods of the Medical Department. Before receiving his detail as acting hospital steward the candidate is required to pass an examination to demonstrate his general intelligence and the progress he has made in his special studies. The examination embraces the general principles of arithmetic, including decimal fractions and the rules of proportion; orthography and penmanship; the Articles of War and regulations affecting enlisted men, particularly in the Hospital Corps; pharmacy; the care and use of meteorological instruments and of the hospital and field appliances furnished by the Medical Department; the methods of rendering first aid to sick and wounded, and the ordinary modes of cooking.

Promotion to a stewardship is not authorized until the candidate has demonstrated his fitness for the position by one year of service as an acting hospital steward. His application must be approved by the senior medical officer of his post and by the post commander, and must bear satisfactory certification as to character, conduct, general fitness and habits, particularly in regard to the use of stimulants and narcotics. Authority is then given by the Surgeon-General for his examination, which includes the subjects already mentioned, together with minor surgery and the elements of hygiene. Passed candidates examined at or about the same time take precedence for appointment in the order of relative merit as shown by the results of their examination.

Furloughs to deserving men are granted during the term of enlistment when their services can be spared from their post of duty.

On re-enlistment at the end of five years $2 per month is added to the rate of pay and $1 per month more on each subsequent re-enlistment.

After thirty years of service members of the Hospital Corps are entitled to be retired, and upon retirement receive three-fourths of the monthly pay allowed by law to them in the grade they held when retired, with commutation for allowances of clothi and rations.

Applications for enlistment into the Hospital Corps should be addressed to "The Surgeon-General U. S. Army, Washington, D. C.," and should be accompanied by testimonials as to character, physical soundness, and special knowledge, as of pharmacy, etc.

CLASSES
—OF THE—
PHILADELPHIA COLLEGE OF PHARMACY,

SEVENTY-FIRST ANNUAL SESSION, 1891-1892.

JUNIOR LIST.

Name.	*Place.*	*State.*	*Preceptor.*
Abbott, William Gilbert,	Trenton,	N. J.	H. N. Richards.
Adams, Bentley Bryant,	Atlantic City,	N. J.	L. C. McClellan.
Adams, James Duffield,	Clayton,	N. J.	R. W. Maris.
Adams, Winfield Scott,	Reading,	Pa.	C. M. Steinmetz.
Albright, William Henry,	Martin's Creek,	Pa.	M. R. Albright.
Aley, Jr., Hamilton,	New York,	N. Y.	W. S. Rockey.
Alleman, Frank,	Lancaster,	Pa.	H. B. Cochran.
Althouse, Frank John,	Harrisburg,	Pa.	H. B. Todd.
Alvey, Rob. Edwin,	Mechanicsburg,	Ill.	C. M. Bird.
Ames, Charles Eugene,	DeRuyter,	N. Y.	Kenyon, Potter & Co.
Archibald, Alfred Guy,	Philadelphia,	Pa.	T. M. Newbold.
Atkins, George Hulings,	Wilmington,	Del.	Z. J. Belt.
Aughinbaugh, William Culbertson,	Hagerstown,	Md.	D. C. Aughinbaugh.
Baer, Howard,	Philadelphia,	Pa.	W. H. Llewellyn.
Bahn, Edwin Morgan,	York,	Pa.	H. A. Hay.
Bailey, John Henry,	S. Bethlehem,	Pa.	Dr. S. T. Addis.
Baker, John Saxe,	Newville,	Pa.	H. K. Mulford & Co.
Balle, Bismark Henry,	Laurens,	S. C.	J. E. Wilkes.
Barlow, Walter Gilbert,	Galion,	O.	L. E Barlow.
Barr, David Ford,	Newark,	Del.	J. R. Smyser.
Barr, Robert Hamilton,	Philadelphia,	Pa.	Jos. McKee.
Baskett, Geo. LaFayette,	Salem,	Or.	N. F. L. VanSlype.
Benedict, William Paul,	Altoona,	Pa.	C. F. Randolph.
Bierman, Valentine,	Shenandoah,	Pa.	A. Wasley.
Blecker, Isaac Boyd,	Selinsgrove,	Pa.	J. F. Wallis.
Boadway, Jacob,	Bethesda,	Ont., Can.	C. G. A. Loder.
Bole, Jr., Robt.,	Philadelphia,	Pa.	J. B. Reynolds.
Bowman, William Frank,	Reading,	Pa.	J. C. Griesemer.
Boyle, Frank Meagher,	Dover,	Del.	C. Ouram.
Brellocks, Frederick John,	Philadelphia,	Pa.	L. W. Hildenbrand.
Bremer, Albert Herman,	Philadelphia,	Pa.	M. Sonntag.
Bric, Jay Steven,	New Haven,	Conn.	
Brickner, Herman Adam,	Canajoharie,	N. Y.	Dygert & Wohlgemuth
Brooks, James Hibbs,	Bristol,	Pa.	Serrill Douglass.
Brooks, Joseph Warren,	Pennsauken,	N. J.	Bullock & Crenshaw.
Brown, Gordon Sweatland,	Laurelton,	Pa.	G. W. Roland.
Brunier, Geo. Washington Grant,	Philadelphia,	Pa.	C. H. Bohn.
Bunting, Frank Allison,	Norristown,	Pa.	W. Stahler.
Cahill, Thomas Melville,	Staffordshire,	Eng.	Dr. J. Malatesta.
Cain, Maude Florence,	Springfield,	Mass.	
Campbell, Robt.,	Belfast,	Ireland,	Dr. Meade.
Campbell, Thomas Palmer,	Philadelphia,	Pa.	Funk & Groff.
Carpenter, Howard Preston,	Wilmington,	Del.	N. B. Danforth.
Carroll, Robt. Allen,	Philadelphia,	Pa.	S. L. Carroll.
Carson, Chas. Robt.	Mahomet,	Ill.	H. A. Newbold.
Chance, Albert Arthur,	Sudlersville,	Md.	G. B. Evans.
Cheek, Simmons Lee,	Birmingham,	Ala.	C. Shivers.
Cherdron, Charles,	Cleveland,	O.	H. Muller, M.D.
Cline, William Edward,	Orrstown,	Pa.	Dr. J. J. McFadden.

Name.	*Place.*	*State.*	*Preceptor.*
Collins, Edward Smith,	Rising Sun,	Del.	
Colsten, Geo. Henry,	Great Bend,	Pa.	C. B. Woodward.
Conard, Norman Shoemaker,	Philadelphia,	Pa.	Dr. T. E. Conard.
Connor, Edward Brooke,	Philadelphia,	Pa.	A. Y. Gerhard.
Connor, Edwin Cairl,	Philadelphia,	Pa.	H. B. Taylor.
Conover, Samuel Harry,	Philadelphia,	Pa.	A. J. Schofield.
Cook, William Stephen Gray,	Coatesville,	Pa.	S. G. Cook.
Corson, Linwood Shamgar,	Seaville,	N. J.	E. W. Sharp.
Cox, Harry Lehman,	Ephrata,	Pa.	G. S. Royer.
Crawford, James Adams,	Nazareth,	Pa.	Dr. C. A. Weidemann.
Croushore, Henry Geo.,	Grapeville,	Pa.	Sowash & Fink.
Dancy, Henry Hyman,	Tarboro,	N. C.	W. H. MacNair.
Dannenhauer, Frederick,	Philadelphia,	Pa.	W. A. Pettus.
Davis, Geo. Warren,	Scranton,	Pa.	A. B. Reed.
Davis, William,	Mt. Carmel,	Pa.	Williams & Co.
Daws, William Ruth,	Scranton,	Pa.	Henwood & Co.
Deibert, William Henry,	Stemton,	Pa.	J. H. Masholder.
Deininger, John Wolfersberger,	Mt. Joy,	Pa.	H. L. Barber.
Dengler, Geo. Ludwig,	Reading,	Pa.	J. A. Gingrich.
Desmond, Edward,	Buffalo,	Wyo.	F. H. Eggleston.
Detwiler, William Penn,	Oak Station,	Pa.	I. M. Buckwalter.
Dietrich, Harry Daniel,	Reading,	Pa.	C. Rentschler.
Dittenhofer, Mortimer Abraham,	Mansfield,	O.	W. M. Barton.
Donough, Chas. Schæffer,	Myerstown,	Pa.	Dr. W. C. Kline.
DuBois, B. Frank,	Atlantic City,	N. J.	J. Du Bois.
Eberly, David Alex.,			C. A. Eckels.
Eisenhart, Ellwood Obadiah,	Hellertown,	Pa.	F. P. Eisenhart.
Eisenhart, Harry P.,	York,	Pa.	B. S. Gilbert.
Elm, Paris Foster,	Shippensburg,	Pa.	J. C. Altick & Co.
Erney, Levi S.,	Allentown,	Pa.	A. S. Erney, M. D.
Esterheld, William Fred.,	Rochester,	N. Y.	J. Esterheld.
Fadeley, Robt Wesley,	Philadelphia,	Pa.	J. Huston.
Faries, William Edwin,	Smyrna,	Del.	L. C. Funk.
Faust, Peter,	Scranton,	Pa.,	C. Lorenz.
Fischer, Frederick Franklin,	Philadelphia,	Pa.	E. C. Vogelbach.
Fisher, Edmund Keim,	Lititz,	Pa.	E. B. Kyle.
Flanagan, Thom. Francis,	Mahanoy City,	Pa.	A. A. Weber.
Fluss, Julius,	Harrisburg,	Pa.	Dr. Raser.
Fraunfelder, Jacob Adams,	Easton,	Pa.	F. G. Thoman.
Furnel, Carl Bennett,	Wilton,	Me.	W. H. Braddock.
Gargan, John Joseph,	Philadelphia,	Pa.	C. J. Biddle.
Garver, Walter Joseph,	Hagerstown,	Md.	Blew & Lucas.
Gebhardt, Ehrgott William,	Philadelphia,	Pa.	E. Graff.
Gary, John Harry,	Thurlow,	Pa.	W. C. Kelly.
Gibson, Hiester Franklin,	Reading,	Pa.	Dr. S. C. Blair.
Glitschka, Henry,	Bismark,	N. D.	F. Frisby.
Goico, Ernest,	Porto Rico,	W. I.	C. J. Monagas.
Goehring, John Geo.,	W. Newton,	Pa.	R. D. Humes.
Gorman, Patrick James,	S. Bethlehem,	Pa.	H. T. Addis.
Gould, Fred. Burr,	Farmer City,	Ill.	S. B. Gower & Son.
Gregory, Robt. Nicholson,	Quincy,	Fla.	Munroe & Scott.
Grubb, Geo. Henry,	Pughtown,	Pa.	J. C. Sanderson.
Haas, Frederick William,	Nazareth,	Pa.	E. G. F. Mickley.
Haas, William Arthur,	South Easton,	Pa.	A. N. Richards.
Haenchen, Emil Frank,	Philadelphia,	Pa.	C. E. Haenchen.
Hahn, Charles,	Minersville,	Pa.	C. E. Howard.
Harms, Herman,	Hamburg,	Germany.	Roberts & Nelden.
Hand, Alfred,	Freeport,	N. Y.	L. H. Wilson.
Haney, Mary Augusta,	Eastport,	Me.	Dr. Grady.

Name.	*Place.*	*State.*	*Preceptor.*
Hargrave, Seymour Livingston,	Snow Hill,	N. C.	R. Fitch.
Harrold, William Henry,	Conshohocken,	Pa.	Dr. J. M. Bradford.
Hart, Joseph Aloysius,	Philadelphia,	Pa.	Fetters & Hertel.
Harter, Charles Schaeffer,	Tylersville,	Pa.	
Hatton, Thomas Mifflin,	Philadelphia,	Pa.	G. B. Evans.
Haug, Clarence Godfrey,	Philadelphia,	Pa.	H. K. Mulford.
Heichhold, Henry Phillips,	Philadelphia,	Pa.	C. H. Bohn.
Heimer, William Henry,	Nazareth,	Pa.	A. B. Wenrich.
Helm, Robt.,	Philadelphia,	Pa.	Nolte & Reimann.
Hendee, Ulysses Grant,	Jamestown,	N. Y.	Hatch & Briggs.
Herlihy, James Aloysius,	Chillicothe,	O.	Dr. C. Chestnut.
Herrmann, William,	Middleport,	Pa.	A. Cable.
Hess, Miles Roscoe,	Hellertown,	Pa.	M. S. Apple.
Hertel, Julius Ernst,	Nashville,	Ill.	W. H. Gruhs.
Hiller, William Frederick,	Osseo,	Minn.	J. F. Donek.
Hinkel, Henry John,	Philadelphia,	Pa.	H. C. Cooley.
Hinkle, Samuel Wisler,	Columbia,	Pa.	P. S. Brugh.
Holcombe, David Hamilton,	Bridgeton,	N. J.	C. F. Dare.
Hollopeter, Arthur Stadiger,	Shenandoah,	Pa.	F. W. E. Stedem.
Holzinger, John Rewalt,	Wrightsville,	Pa.	G. S. Tinsley.
Hoopes, Wilmer Preston,	Hickory,	Md.	E. Preston, Jr.
Horsky, Rudolph,	Helena,	Mont.	
Horting, Geo. Washington,	Ephrata,	Pa.	C. C. Spannagel.
Hoskins, John,	Elwyn,	Pa.	Wm. Procter, Jr. & Co.
Hughes, William Alfred,	Bangor,	Pa.	R. D. Williams.
Hunsberger, Ambrose Souders,	Soudertown,	Pa.	C. E. Spenceley, Ph.G.
Jackel, John Otto Peter,	Philadelphia,	Pa.	G. D. Jones.
Jaeger, Ernst Charles,	Neosho,	Mo.	A. B. Powers.
Janisch, William,	Philadelphia,	Pa.	Wm. Weber.
Janney, Edward Walker,	Baltimore,	Md.	R. Shoemaker & Co.
Jenkins, Holliday Green,	Wyoming,	Del.	Dr. A. F. Tod.
Jones, Henry Abner,	Lansford,	Pa.	Kennedy & Burke.
Jones, Jr., Pleasant Richard,	Danville,	Va.	P. R. Jones.
Jones, William Willits,	Williamsport,	Pa.	Duble & Cornell.
Kauffman, John William,	Norristown,	Pa.	Dr. W. H. Hickman.
Kaye, Emma Louisa,	Philadelphia,	Pa.	John Kaye, M.D.
Keefer, Edgar Cyrus,	Chambersburg,	Pa.	Cressler & Keefer.
Keller, Robert Jacob,	Easton,	Pa.	J. C. Sanderson.
Kelley, T. J.,	Philadelphia,	Pa.	Dr. A. F. Tod.
Kennedy, Edwin Russell,	Zanesville,	O. W. M.	Chappelear & Son Co.
Kenworthy, John,	Coatesville,	Pa.	Geo. W. Davy.
Kephart, Thomas Albert Calvin,	Altoona,	Pa.	J. A. McKee.
Kernan, Eugene Callistus,	Jacksonville,	Fla.	W. H. Llewellyn.
Kinard, Harry,	Craley,	Pa.	Elias Herr.
Kinsey, Joseph Samuel,	New Philadelphia,	O.	F. C. Miller & Son.
Kirchhoff, Harry Carl,	Bridgeton,	N. J.	T. C. Tomlinson.
Kirk, John Hammond,	Chester,	Pa.	E. T. Byrne.
Kirk, Lewis Richardson,	Rising Sun,	Md.	L. R. Kirk.
Kirk, Samuel Bird,	Curwensville,	Pa.	J. T. Shinn.
Kittson, Edwin Faust,	Philadelphia,	Pa.	Dr. A. S. Erney.
Klinefelter, Chas.	Wyoming,	Pa.	A. Nebeker, M.D.
Knoop, Edgar.	Troy,	O.	G. F. Parsons.
Koch, Harry Warren,	Bethlehem,	Pa.	H. A. Burkhart.
Kocher, David Geo.,	Ballietsville,	Pa.	A. J. Kendig.
Koeppen, Albert Chas.,	Sioux Falls,	S. D.	L. F. Dunning.
Kottcamp, Abraham Francis,	York,	Pa.	G. H. Ischler.
Kottka, Rav Weaver,	Philadelphia,	Pa.	D. L. Stackhouse.
Kramer, Jesse Ray,	Williamsport,	Pa.	M. Huber.
Kreider, Harry Clinton,	Lebanon,	Pa.	D. F. Shull & Co.

Name.	*Place.*	*State.*	*Preceptor.*
Kyner, Thomas Kennedy,	Orrstown,	Pa.	J. A. Kyner.
Lacey, Chas.,	Ridley Park,	Pa.	F. E. Harrison.
Lamar, William Robinson,	Augusta,	Ga.	S. C. Durban.
Lanterman, Bartley LaRue,	Blairstown,	N. J.	A. Lincoln Serfass.
Lawall, Chas. Herbert,	Bloomsburg,	Pa.	Moyer Bros.
Leberknight, Adam Miller,	Orrstown,	Pa.	C. E. Slough.
Leedom, Morris,	Philadelphia,	Pa.	Watt & Leedom.
Legg, Frederick Arthur,	Salem,	Or.	Dr. Horace Cox.
Leh, Geo. Dodson,	Bethlehem,	Pa.	Dr. C. B. Lowe.
Lehman, Joseph Davis,	Manayunk,	Pa.	H. M. Levering.
Leix, Louis,	Altoona,	Pa.	C. B. Baumgardner.
Linn, William Elliot,	Philadelphia,	Pa.	John C. Keys.
Lloyd, Richard Louis,	Philadelphia,	Pa.	Bullock & Crenshaw.
Long, James Grier,	Coatesville,	Pa.	
Loper, Chas. P.,	Philadelphia,	Pa.	C. H. Haentze.
Loveland, Roland Wayne,	Mt. Holly,	N. J.	B. J. Statham.
Lower, Geo. Grafley,	Philadelphia,	Pa.	Wiley & Wallace Co.
Lukens, Chas. Baker,	Philadelphia,	Pa.	D. A. Over.
Lynch, John Jos.,	Philadelphia,	Pa.	Grove & Bro.
Lynch, Dan'l Jos.,	Plymouth,	Pa.	Dr. K. H. Franklin.
Lynn, Wm. Wirt,	Philadelphia,	Pa.	W. H. Lantz.
McClellan, Samuel Lee,	Cochranville,	Pa.	S. K. Hammond.
McCoy, Cornelius Jos.,	Conshohocken,	Pa.	Dr. T. H. Franklin.
MacCracken, Edward Glover,	Philadelphia,	Pa.	J. W. Pechin.
McCreight, Chas.,	Philadelphia,	Pa.	Robert McNeil.
MacDermott, James,	Philadelphia,	Pa.	Girard College.
MacDouald, Frederick Thomas,	Avondale,	Pa.	C. H. Megilligan.
McGlade, John,	Pittsburgh,	Pa.	H. Diefenbeck.
McHale, Francis Patrick,	Dunmore,	Pa.	M. S. Stark.
McNeal, Harry Benny,	McDanieltown,	Md.	John H. Fredericks.
Mackie, Arthur Andrews,	Fairhill,	Md.	W. R. Warner & Co.
MacNair, Ivy Forman,	Tarboro,	N. C.	C. C. Meyer.
Manko, Emanuel,	Trenton,	N. J.	S. E. R Hassenger.
Mann, Harry Eastwood,	Burlington,	N. J.	S. W. Lippincott.
Martin, Samuel E.,	Wilmington,	Del.	F. W. Fenn.
Martin, Merry Omah,	Wesson,	Miss.	Mrs. T. N. C. Westerfield.
Maxwell, Frank Fargo,	Frenchtown,	N. J.	A. P. Williams.
Meals, Gabriel Franklin,	Gettysburg,	Pa.	J. M. Huber.
Meink, Fred. William,	Cleveland,	O.	Mayell Hopp Co.
Melick, Ralph Lashelle,	Sunbury,	Pa.	G. B. Evans.
Meller, Jos. A.,	Galena,	Ill.	H. B. Morse.
Mentzer, Harvey H.,	Carlisle,	Pa.	V. H. Ritchey.
Merscher, Geo. Edward,	Philadelphia,	Pa.	J. R. Moechel.
Metzger, Chas. Washington,	Abbottstown,	Pa.	J. M. Bourke.
Miller, Geo. M.,	Sumneytown,	Pa.	J. S. Miller.
Missildine, Arthur Huntington,	Winter Park,	Fla.	John Ogden.
Missimer, Harry Drexel,	Reading,	Pa.	C. Rentschler.
Mohr, Frank Martin,	Philadelphia,	Pa.	D. Milligan.
Mooradian, Thos. Mooshake,	Bitlis, Turkey in Asia,		C. G. A. Loder.
Murphy, Chas. Webb,	Avondale, Cincinnati,	O.	L. N. Berube & Co.
Neely, Horace Shively,	Fairfield,	Pa.	J. M. Griffin.
Nick, Wm. Herman F.,	Erie,	Pa.	W. F. Nick.
Nolan, Daniel Andrew,	Southington,	Conn.	Campbell & Bro.
Nusbaum, Benjamin,	Philadelphia,	Pa.	A. Oetinger.
Odbert, Alex. Laughlin,	Wheeling,	W. Va.	C. H. Odbert.
Opperman, Paul Julius,	Cleveland,	O.	E. Opperman.
Pashley, Frederick Henry,	Bridgeton,	N. J.	D. A. Bowen.
Paullin, Geo. Lambert,	Shiloh,	N. J.	H. F. Seeley.
Pennington, G. M.,	Stannardsville,	Va.	Wills Drug Co.

Name.	*Place.*	*State.*	*Preceptor.*
Philips, Geo. Warren,	Garden,	Pa.	J. E. Gregory.
Philips, Robert Hazlett Cummings,	Trenton,	N. J.	Dr J. W. Ward.
Pickett, Jas. Frank,	Newhope,	Pa.	Dr. S. Jones.
Pickering, Geo. Wellington,	South Gibson,	Pa.	F. Bronton.
Pollak, Berthold Steinbach,	Vienna,	Austria,	W. H. Sutton.
Poole, Henry Harrison Higbee,	Bristol,	Pa.	H. G. Peters.
Powders, John Arthur,	Orrstown,	Pa.	Dr. Emil Reith.
Price, Harry Dunbavon,	Independence,	Mo.	F. Price.
Prizer, Walter Wm.,	Norristown,	Pa.	Baker & Grady.
Pyfer, Howard F.,	Lancaster,	Pa.	C. A. Heinitsh.
Quick, Benj. Chamberlin,	Port Jarvis,	N. Y.	S. St. John.
Reed, Oros,	Atlantic City,	N. J.	E. S. Reed.
Reeser, Wm. Howard,	Reading,	Pa.	L. P. Bowers.
Reeves, Andrew Higgins,	Cape May,	N. J.	J. Mecray.
Regar, Wayne Schaffer,	Denver,	Pa.	Dr. W. L. Matthews.
Rehfuss, Jacob H.,	Eaton,	O.	J. B. Moore.
Reinoehl, David Vogt,	Lebanon,	Pa.	J. H. Garman.
Revell, Burton Cannon,	Falls of Schuylkill,	Pa.	
Rickert, Wm. McKinstry,	Philadelphia,	Pa.	W. F. Seiler.
Riegel, Chas. Heber,	Reading,	Pa.	F. X. Wolf.
Risley, John Clarence,	Wilmington,	Del.	E. B. Fell.
Rogers, John Wilson,	Independence,	Mo.	C. J. Gebauer.
Rothrock, Harry Geo.,	Bethlehem,	Pa.	D. G. E. Musselman.
Ruete, Otto Moyer,	Dubuque,	Ia.	T. W. Ruete.
Ruff, Harry Jos.,	Woodstown,	N. J.	V. C. Roberts.
Sage, Thos..	Blossburg,	Pa.	S. Bowen.
Sahm, John Louis,	Dubuque,	Ia.	T. W. Ruete.
Sams, Jas.,	Warrensburg,	Mo.	J. D. Eads & Co.
Saybolt, Geo. Henry,	Philadelphia,	Pa.	W. E. Supplee & Bro.
Schmickle, Chas. Franklin,	Nazareth,	Pa.	J. H. Munson.
Schnuerer, Geo. John,	Cleveland,	O.	H. Tilke.
Schumann, August Frank,	Philadelphia,	Pa.	R G. S. Weber.
Seiffert, Frank Morris,	York.	Pa.	B. S. Gilbert.
Sellers, Oscar Wm.,	Windsor Castle,	Pa.	G. W. Fehr.
Sellen, Edward,	Davenport,	Ia.	C. F. Jappe & Co.
Shallcross, Wm. Gooding,	Locust Grove,	Md.	C. B. Hunterson.
Sharp, Wm. Walls,	Harrington,	Del.	Z. C. Fleming.
Shelley, Elwood Renals,	Galion,	O.,	B. N. Bethel.
Sheppard. John Ware,	Cedarville,	N. J.	H. C. Blair's Sons.
Shimer, Miles,	Philadelphia,	Pa.	J. D. Rishell & Co.
Shimer, Arthur Burton,	Martin's Creek,	Pa.	L. Oliphant.
Shoemaker, Chas. Benj.	Hummelstown,	Pa.	G. W. Shoemaker.
Shore, Washington,	Philadelphia,	Pa.	
Simonis, Jr., Otto,	Philadelphia,	Pa.	W. A. Rumsey.
Simpson, Chas. Reed,	Altoona,	Pa.	H. S. Murray.
Smink, Robert Wilson,	Shamokin,	Pa.	W. Delker, M.D.
Smith, Jesse Kirk,	Downingtown,	Pa.	P. Fitch, M.D.
Smith, Jos. Vanest,	Philadelphia,	Pa.	R. W. Cuthbert.
Smith, Lizzie Pierce Eldridge,	Philadelphia,	Pa.	W. H. Hickman, M.D.
Smith, Robert Victor,	York City,	Pa.	Dale Hart & Co.
Smyser, Willis Lannis,	York,	Pa.	J. F. Patton.
Snyder, Frank Howard,	Mahanoy City,	Pa.	J. W. Snyder.
Sprowles, Walter Hall,	Frankford,	Pa.	J. M. Wert, M.D.
Stacks, Chas. Markwood,	Steelton,	Pa.	Dr. D. Hunter.
Stanton, Thomas Jefferson,	Chester,	Pa.	R. H. Henderson.
Steere, Frederick Eugene,	Petersburg,	Va.	Steere, Wells & Co.
Steltz, Harry Smoyer,	Pottstown,	Pa.	Dr. C. Trego.
Stern, Chas. Wilson,	Smyrna,	Del.	F. E. Morgan.
Stewart, Samuel Shelton,	Leetonia,	O.	H. H. Ink & Co.

Name.	*Place.*	*State.*	*Preceptor.*
Stratton, Jas. Pennington,	Woodstown,	N. J.	Borton & Andrews.
Stroud, Arthur Howell,	Chestnut Hill,	Pa.	Thos. L. Buckman.
Stroup, Clement Bryant,	Elizabethville,	Pa.	Dr. J. C. Stroup.
Sutton, John Dorrance,	Wilkesbarre,	Pa.	Dr. C. W. Spayd.
Terry, John Herman,	Plano,	Tex.	W. S. Whiteley.
Thayer, Houston Talbot,	Chattanooga,	Tenn.	Block, Drackett & Co.
Thompson, Alex. Peterson,	Philadelphia,	Pa.	W. L. Cliffe.
Thompson, Benjamin Spangler,	Carlisle,	Pa.	J. E. Sipe.
Todd, Chas. Kelly,	Harrisburg,	Pa.	S. L. Nell.
Tomkinson, Horace Lessy,	Harrisburg,	Pa.	B. B. Hamlin.
Traub, Elmer,	Philadelphia,	Pa.	G. W. Shingle.
Ullmann, Geo.,	Philadelphia,	Pa.	
Utech, Philip Henry,	Meadville,	Pa.	J. G. Lindeman.
Van Dyke, John Burt,	Philadelphia,	Pa.	Van Dyke Bros.
Velazquez, Enrique,	Costa Rica,	C. A.	Wm. Harris.
Vogelbach, Jacob Harrison,	Melrose,	Fla.	G. W. Shingle.
Wachtell, John Kirby,	Muncie,	Ind.	Dr. E. H. Evans.
Wagner, Chas Wesley,	Hartleton,	Pa.	M. L. Mench.
Ward, Merton Barber,	Wilmington,	Del.	T. C. Taylor.
Weakley, Chas. Carpenter,	Media,	Pa.	Geo. Holland.
Wehler, Ira Randolph,	Oxford,	Pa.	S. P. Wright.
Weidler, Chas. Lincoln,	Portland,	Or.	Bullock & Crensha w
Weiser, Spencer Bucher,	Millersburg,	Pa.	F. R. Weiser, M.D.
Weissmiller, Oscar Emmett,	Monroe,	Wis.	W. P. Stearns.
White, Chas. Morrison,	Chandlersville,	O.	W. K. Lits.
Whiteley, Jos. C.,	Philadelphia,	Pa.	G. C. Webster.
Whitman, Fred. Ellison,	Canton,	Pa.	W. W. Whitman.
Whitman, Wm. Jas.,	Philadelphia,	Pa.	F. F. Drueding.
Wilcox, Wm.,	Blackwood,	N. J.	R. Willard.
Williams, Herbert Forrest,	Tamaqua,	Pa.	J. L. Patterson.
Wilson, John Swain,	Burlington,	N. J.	H. B. Weaver.
Wirth, Alex. Edward,	Milwaukee,	Wis.	Oscar Zinn.
Wissler, Arthur John,	Edinburg,	Va.	H. C. Blair's Sons.
Wood, Geo. Young,	Toronto,	Can.	R. W. Maris.
Yerkes, Chas. Markley,	Philadelphia,	Pa.	J. R. Angney, M.D.
Young, Horace Greely,	Bristol,	Pa.	J. K. Young.
Young, Spencer,	Mifflinburg,	Pa.	G. H. Jackson & Co.
Zeller, Chas. Adam,	Tremont,	Pa.	Aaron G. Miller.

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Alter, Geo. Merchant,	Blairsville,	Pa.	Dr. H. S. Bossart.
Anderson, Clarence Geo.,	E. Liverpool,	O.	A. H. Bulger.
Angeny, Granville Louis,	Philadelphia,	Pa.	Dr. H. H. Shirk.
Angle, Jay Warren,	Lewisburg,	Pa.	H. C. Blair's Sons.
Armstrong, Eugene Curtis,	Odessa,	Del.	Dr. J. A. Ogden.
Bacon, Harry Augustus,	Philadelphia.	Pa.	Dr. T. E. Conard.
Bailey, Arthur Hamilton,	Harrisburg,	Pa.	Forney & Knouse.
Bailey, John,	Canterbury,	Del.	J. A. Cox & Co.
Barkhuff, Hugh Augustus,	Amsterdam,	N. Y.	J. A. Barkhuff.
Beaver, Samuel,	Annville,	Pa.	W. S. Seabold.
Beavers, Frank Washington,	Scranton,	Pa.	G. W. Jenkins.
Beers, Benj. Franklin,	Wilkesbarre,	Pa.	J. G. Meyer.
Beidler, William,	Wilmot,	O.	Dr. S. Wolf & Son.
Bement, Fred. Claud,	Ithaca,	N. Y.	White & Burdick.
Bennett, Samuel Day,	Millville,	N. J.	M. Ludlam.
Berg, Leroy,	Tyrone,	Pa.	M. S. Falk.
Berkemever, Francis Molton,	Allentown,	Pa.	Dr. L. C. Berkmeyer.

Name.	*Place.*	*State.*	*Preceptor.*
Berkstresser, Watson J.,	Huntington,	Pa.	J. H. Black & Co.
Binkley, Harry J.,	Reading,	Pa.	W. F. Potteiger.
Birk, William Martin.	Indianapolis,	Ind.	G. F. Borst.
Blackman, Augustus Smith,	Le Raysville,	Pa.	L. P. Blackman.
Blair, Harry Cowan, 3d,	Philadelphia,	Pa.	H. C. Blair's Sons.
Blaut, Adam John,	Trenton,	N. J.	W. G. Nebig.
Blow, Robt. Gillingham,	Beverly,	N. J.	Dr. A. W. Taylor.
Boltz, Elias Kline,	Lebanon,	Pa.	Dr. V. H. Allwein.
Boyd, John Samuel,	Philadelphia,	Pa.	Wm. R. Warner & Co.
Bradley, William Nathaniel,	Philadelphia,	Pa.	Dr. S. W. Gadd,
Brennan, John Thomas,	Philadelphia,	Pa.	Dr. R. J. Kelly.
Brick. Harry Walter,	Fitchburg,	Mass.	Bullock & Crenshaw.
Bromley, Rufus Wilder,	Philadelphia,	Pa.	
Brown, Albert Ludwig,	Reading,	Pa.	McCurdy & Dunham.
Brown, Charles,	Philadelphia,	Pa.	W. J. Pechin.
Brown, Edmund Lee,	Marshall,	Mo.	M. A. Brown.
Butcher, Charles Monroe,	Parkersburg,	W. Va.	Wm. W. Kain.
Calhoun, Albert Reid,	Philadelphia,	Pa.	Horace Moll.
Cameron, Elmer Lindsay,	Chambersburg,	Pa.	J. S. Nixon & Son.
Campbell, Joseph,	Chestnut Hill,	Pa.	J. L. Kooker.
Campbell, Theodore,	Daretown,	N. J.	W. H. Pile & Son.
Carey, Harry Caspar,	Bridgeport,	N. J.	H. C. Blair's Sons.
Carney, Geo. Elmer,	Philadelphia,	Pa.	
Carter, Herbert Gent,	Philadelphia,	Pa.	Jos. Moffett, Jr.
Casey, John Francis,	Philadelphia,	Pa,	Bullock & Crenshaw.
Chalfant, William Windle,	Unionville,	Pa.	L. C. Funk.
Clair, Jos. Sylvester,	Camden,	N. J.	W. R. Weiser.
Clark. William Gorgas,	Harrisburg.	Pa.	J. R. Smyser.
Coffey, Maurice Grant,	Lock Haven,	Pa.	G. W. Mason.
Collins, Thomas Philip,	Tiffin.	O.	J. F. Marquardt & Son
Conard, Geo. McClellan,	Philadelphia,	Pa	C. H. Senderling.
Conyers, Zeb. Vance,	Tarboro.	N. C.	Stenton & Zoeller.
Cornell, Wharton Landis,	Wilmington,	Del.	N. B. Danforth.
Craig, Charles Franklin,	Massillon,	O.	E. S. Craig.
Croft, Wm. Kinnard,	St. Thomas,	Pa.	J. L. Barnitz.
Cushen Harry Roscoe,	Hagerstown,	Md.	E. R. Gatchel.
Daniels, Geo. Edmund,	Pueblo,	Col.	A. C. Daniels.
Davis, Benj. Franklin,	Lebanon,	Pa.	W. L. Hartzell.
Davis Harry Morgan,	Upper Darby,	Pa.	Harry Cox.
Deen. William Lewis,	Lancaster,	Pa.	R. H. Lackey.
DeFord, Chas. Henry,	Ottawa,	Kan.	C. L. Becker.
DeLaCour, Jos. Carl.	Camden,	N. J.	J. C. DeLaCour.
DeVries, Jr., Robt. Tivis,	Wheeling,	W. Va.	Chas. Menkemeller.
Donecker, Edwin Alfred,	Allentown,	Pa.	Petus & Smith.
Donoghue, Robt. Ligorius,	Philadelphia,	Pa.	W. A. Musson.
Dowd, Andrew William,	Hastings,	Neb.	Dr. A. H. Smith.
Driesbach. Luther Albert,	Easton,	Pa.	W. E. Hammon.
Durham, John McCurdy,	Reading.	Pa.	McCurdy & Durham.
Eckhard, Schuyler Colfax,	Coldwater,	Kan.	Dr. J. E. Sombart.
Elliott, Arthur Hugh,	Mansfield,	Pa.	Dr. C. V. Elliott.
Elston, Clarence William,	Downingtown,	Pa.	J. H. Stermer.
Eppley, John Hake,	Three Rivers,	Mich.	W. K Mattern.
Eppstein, Jacob,	Hoppstædten,	Germany,	H. F. Backenstoe.
Eshbach, William Wallace,	Bethlehem,	Pa.	Geo. P. Kern (dec'd).
Fadeley, Robt. Wesley,	Philadelphia,	Pa.	James Huston.
Failing, John Peter,	Palatine Bridge,	N. Y.	H. K. Mulford & Co.
Ferguson, Enoch Pennock,	Coatesville,	Pa.	J. C. Roberts.
Fessler, Thos. Addison,	Muncy,	Pa.	J. W. Frey.
Finkbiner, Martin Luther,	Parker's Ford,	Pa.	L. J. Shuler.

Name.	*Place.*	*State.*	*Preceptor.*
Finkeni, Wm. Caspar,	Camden,	N. J.	Dr. G. W. Henry.
Finney, John Jos.,	Conshohocken,	Pa.	H. G. J. Hallowell.
Fox, James Floyd,	Newton,	Kan.	J. W. Hurst.
Frankelberger, Allen J.,	Lewisberry,	Pa.	J. J. Ottinger.
Fredericks, Henry,	Philadelphia,	Pa.	L. C, Funk.
Furman, Josiah Hodkinson,	Bloomsburg,	Pa.	G. B. Evans.
Gabler, Theodore Julius,	Philadelphia,	Pa.	F. N. Willard.
Garcia, Juan Reyes,	Porto Rico,	W. I.	R. C. Martin.
Gillespie, Wallace Gault,	Philadelphia,	Pa.	Bullock & Crenshaw.
Githens, Frank Smith,	Salem,	N. J.	H. K. Mulford & Co.
Goodman, James,	Mahanoy City,	Pa.	G. W. Davenport.
Gradwohl, John Frederick,	Wilmington,	Del.	Z. J. Belt.
Green, William Valentine,	Reading,	Pa.	R. R. May.
Gressley, William Robt.,	York,	Pa.	J. E. Lehman.
Grotevent, John Frederick,	Harrisburg,	Pa.	Dr. T. E. Conard.
Guerin, Joseph Alex.,	Summerville,	S. C.	Dr. H. C. Guerin.
Guest, Owen Lovejoy,	Swedesboro,	N. J.	S. S. Guest.
Hadley, Harry Cornish,	Kenett Square,	Pa.	D. W. Hutchison.
Hahn, Herman Frederick,	Harrisburg,	Pa.	Dr. G. H. Markley.
Hahn, Moses Alex.,	Mobile,	Ala.	J. T. Hawkins.
Haines, Oliver Benj. Jacob,	Litzenberg,	Pa.	J. V. Slaughter.
Haines, Jos. Ridgeway,	Lumberton,	N. J.	Prickett & Barrington.
Hall, Chas. Albert,	Renovo,	Pa.	W. E. Hall (dec'd).
Hall, Thos. Murphy,	Middleton,	Del.	H. Knight.
Hallowell, Bruce Clyde,	Philadelphia,	Pa.	G. S. R. Wright.
Hand, Harry Cobb.,	Cape May C. H.,	N. J.	J. Way.
Harbach, Edward Jacob,	Reading,	Pa.	W. L. Cliffe.
Harders, MaeThompson,	Philadelphia,	Pa.	Susan Hayhurst, M.D.
Haydock, Susanna Garrigues,	Philadelphia,	Pa.	Susan Hayhurst, M.D.
Head, Ray C.,	Latrobe,	Pa.	
Healy. Jos.,	Philadelphia,	Pa.	J. T. Shinn.
Hechler, Edward Henry,	Cleveland,	O.	G. L. Hechler.
Heckler, Jr., Franklin Jacob,	Columbia,	Pa.	P. S. Brugh, M.D.
Heim William Joseph,	Philadelphia,	Pa.	E. Jungmann.
Henritzy, Oscar Edwin,	Slatington,	Pa.	John B. Reynolds, Ph.G.
Henry, William Frederick,	Bellaire,	O.	M. N. Mercer.
Hersey, Walter Hayes,	Wilmington,	Del.	J. S. Beetem.
Hess, Harry Reed,	Montgomery,	Pa.	Dr. C. B. Lowe.
Hickman, Thomas Elwood,	Lombard,	Md.	W. H. Hickman, M.D.
Hilpert, William,	Philadelphia,	Pa.	Dr. J. J. Beyer.
Hobson, William Heverin,	Dover,	Del.	F. Dunning.
Hodgson, Edwin,	Newport,	Tenn.	H. E. Jones.
Holtzhausser, Geo. Jacob,	Landau,	Germany,	C. A. Werckshagen.
Hornby, Walter Melvin,	Roxboro, Phila.,	Pa.	H. H. Anderson.
Hutchison, Burtt Taylor,	Bangor,	Pa.	S. E. R, Hassinger.
Jacob, Walter William,	West Grove,	Pa.	G. B. Evans.
Jacoby, William Lawless,	Philadelphia,	Pa.	Bullock & Crenshaw.
John, Harry J.	Homestead,	Pa.	F. J. John.
Johnson, Edward Franklin,	Gilroy,	Cal.	Dr. E. L. Parramore.
Jones, Lester David,	Manchester,	Ia.	Wm. Procter, Jr., Co.
Jordan, Howard Marion,	Burlington,	Ia.	Price & Weise.
Kaercher, Henry Festus,	Youngstown,	O.	W. C. Gans
Kalenborn, Rudolph Alexis,	Tacoma,	Wash.	Stewart & Holmes Drug Co.
Karcher, James Daniel,	Marmosa,	N. J.	Dr. T. C. Wheaton.
Kearns, William,		Ireland.	J. P. Mallon.
Keiper, Harvey Lafayette,	Allentown,	Pa.	A. Weber.
Ketterer, Martin,	Philadelphia,	Pa.	E. E. Wilson.
Keyes, Minor Ellery,	Gravity,	Pa.	W. A. Converse.
Kimmerer, Geo. Carl,	Canajoharie,	N. Y.	W. S. Bellinger.

Name.	*Place.*	*State.*	*Preceptor.*
Kline, Alvin B.,	Bellefonte,	Pa.	F. P. Green.
Kline, Harry Jos.,	Wilkesbarre,	Pa.	Dr. C. W. Spayd.
Klopp, Louis Calvin,	N Heidelberg,	Pa.	Dr. P. P. Klopp.
Kocher, David Geo.,	Balliettsville,	Pa.	A. J. Kendig.
Kogelschatz, John William,	Martinsburg,	W. Va.	J. B. Hall.
Kohler, Charles,	Philadelphia,	Pa.	H. G. Kalmbach.
Krall, Geo. Heyde,	Mechanicsburg,	Pa.	Eberly Bros.
Krall, John Thomas,	Philadelphia,	Pa.	C. C. Sanderson.
Kunkel, Daniel,	New Ringgold,	Pa.	Dr. A. S. Erney.
Kunkel, Willis Geo.,	Bloserville,	Pa.	W. F. Horn.
Laessle, Henry Adolph,	Philadelphia,	Pa.	Dr. F. Seitz.
Lambert, Geo. Taylor,	Philadelphia,	Pa.	G. B. Evans.
Lammer, Henry Bruno,	Philadelphia,	Pa.	Smith, Kline & French Co.
Lammer, Jacob Sigmund,	Philadelphia,	Pa.	F. J. Lammer.
Landis, Chas. Paul,	Roxboro, Phila.,	Pa.	C. Petzelt.
Landon, Francis Patterson,	Salem,	Va.	H. G. Comp.
Larkins, Charles Thomas,	E. Liverpool,	O.	W. W. Robinson.
Lefferts, Henry Tomlinson,	Southampton,	Pa.	J. V. Antill.
Leidich, Sylvester Weidknecht,	Bethlehem,	Pa.	R. Kindig, M.D.
Lewis, Jr., John F.,	Gordon,	Pa.	J. E. Gregory.
Lilly, Howard Harrison,	Pottsville,	Pa.	J. Williamson.
Lippincott, Jesse Diverty,	Woodbury,	N. J.	A. S. Marshall.
Lipscomb, Lawton Carlisle,	Columbia,	S. C.	Dr. D. S. Pope.
Long, Howard Edgar,	Reading,	Pa.	J. C. Sanderson.
Long, Jr , Wm. Henry,	Philadelphia,	Pa.	William Harris.
Lorah, James Reber,	Lorah,	Pa.	N. G. Ritter.
Lorah, Lester Irwin,	Emlenton,	Pa.	S. S. Myers.
Lowe, Francis Adolph,	Kansas City,	Mo.	M. Noll.
Luchsinger, Samuel Charles,	Monroe,	Wis.	W. P. Stearns.
Lumb, Chas. Thomas,	Philadelphia,	Pa.	A. S. Lumb.
Lupin, Emanuel,	Russia,	Europe,	H. K. Mulford.
Lynch, Edmund Thomas,	Wilmington,	Del.	E. P. Stephens.
MacDermott, Sarah,	Media,	Pa.	G. C. Webster.
Mackey, Geo. Clarence,	Belvidere,	N. J.	H. C. Blair's Sons.
Manning, Chas. LaForge,	Philadelphia,	Pa.	R. W. Maris.
Martin, James Henderson,	Maysville,	Ky.	G. M. Phillips.
McBride, James Edward,	S. Bethlehem,	Pa.	J. E Grove.
McCandless, Edward Sloan,	Philadelphia,	Pa.	H. C. Eddy.
McCartney. Frank Stewart,	Altoona,	Pa.	W. C. McCartney.
McCokle, William,	Philadelphia,	Pa.	T. A. Walker.
McCormick, Robt. Rogers,	Mechanicsville,	Ia.	G. W. Huston.
McDonnell, Chas. Pancratius,	Philadelphia,	Pa.	Dr. J. M. Wallis.
McFarland, Robert,	Philadelphia,	Pa.	W. V. Stansbury.
McFarland, Robt Munford,	Henderson,	Ky.	C. F. Kleiderer.
McKee, Francis Town,	Wilmington,	Del.	J. P. Williams.
McLaughlin, Raphael Alfred,	Philadelphia,	Pa.	J. Wyeth & Bro.
McWilliams, Samuel,	Jennersville,	Pa.	T. L. Buckman.
Megert, Geo. Emery,	Granbury,	Tex.	E. Megert.
Mengel, Chas. Edward,	California,	Mo.	A. F. Snow.
Meroney, John P.	Camden,	S. C.	Dessausure & DeLorme.
Merrifield, Robt ,	Scranton,	Pa.	Ella Amerman (dec'd).
Meyers, Louis Joseph,	Conshohocken,	Pa.	C. Moylan.
Miller, John Harvey,	Pottsville,	Pa.	Dr. C. D. S. Fruh.
Miller, Roshier,	Honeybrook,	Pa.	W. L. Turner & Son.
Milliken, Wm. Huston,	Philadelphia,	Pa.	E. C. Jones.
Mitchell, Henry,	Philadelphia,	Pa.	C. W. Hallowell.
Monaghan, Wm. Joseph,	Girardville,	Pa.	J. H. Evans.
Moore, Frank Reynolds,	Clarksburgh,	W. Va.	H. L. Wells.
Morgan, Julius Everard,	Smithfield,	N. C.	H. C. Blair's Sons.

Name.	*Place.*	*State.*	*Preceptor.*
Morris, Chas. Henry,	Loganton,	Pa.	H. L. Stiles.
Mueller, Chas. August,	Philadelphia,	Pa.	Alex. Keller.
Mendorf, Harry Kempton,	York,	Pa.	G. W. Fulmer.
Murrell, Alex. Harrison,	Allen,	Md.	Dr. H. H. Sherk.
Myers, Henry Joseph,	Philadelphia,	Pa.	J. B. Cook.
Netherton, Samuel Oliver,	Eureka,	Kan.	E. N. Bailey & Co.
Neville, William,	Conshohocken,	Pa.	H. K. Kroh.
Nichols, Albert Spencer,	Syracuse,	N. Y.	I. Cohen.
Noon, Edward John,	Philadelphia,	Pa.	Louis Genois.
Nye, Frederick John,	Groton,	N. Y.	N. A. Collings.
Oberhauser, Wm. Phillips,	Peoria,	Ill.	J. S. Bell.
O'Brien, Wm. Joseph,	Lambertville,	N. J.	M. Campbell & Bro.
Odwolt, Wood Morris,	Piedmont,	W. Va.	H. C. Shaw.
Parvin, Harry Rocap,	Bridgeton,	N. J.	A. S. Elwell.
Paxson, Elmer May,	Philadelphia,	Pa.	H. J. Batdorf.
Pazmiño, Francisco,	Ecuador,	S. A.	H. C. Manlove.
Peacock, Josiah Comegys,	Millington,	Md.	Henry Trimble, Ph.M.
Pellett, Gurdon Ellis,	Scranton,	Pa.	R. W. Cuthbert.
Pfromm, Geo. W.,	Philadelphia,	Pa.	D. S. Wiltberger.
Peters, Rewellin Cornelius,	Allentown,	Pa.	C. J. Biddle.
Peterson, Walter Vickerstoff,	Philadelphia,	Pa.	C. W. Shull.
Pettyjohn, Wm. Quinn,	Groveland,	Ill.	Frost & Ruif.
Portser, Chas. Henry,	Saltsburg,	Pa.	Dr. H. C. Watt.
Post, Francis Elmer,	Towanda,	Pa.	H. C. Lutz.
Putnam, Silas Oscar,	Leavenworth,	Kan.	J. H. Field.
Quattlebaum, Michael Jenkins,	Batesburg,	S. C.	O. J. Harris.
Randal, Harry Lee,	Shepherdstown,	W. Va.	S. C. Sanderson.
Ranney, Edwin Cole,	Red Cloud,	Neb.	Hicks Brothers.
Reap, Edward Augustus,	Pittston,	Pa.	J. Feldman.
Reid, Vivian Ivanhoe,	Kansas City,	Kan.	Randles & Son.
Reidenbach, Elmer Augustus,	Lititz,	Pa.	H. B. Cochran.
Reif, Ernest,	Philadelphia,	Pa.	L. J. Steltzer.
Reifsnyder, David Ernst,	Berks County,	Pa.	Dr. Donough.
Remington, Samuel Jacobs,	Philadelphia,	Pa.	John Wyeth & Bro.
Richardson, James Henry,	Charlestown,	Md.	Dr. L. R. Kirk.
Rishton, Wm. Sloan,	Bloomsburg,	Pa.	J. H. Mercer.
Roberts, Rees Connard,	Norristown,	Pa.	J. B. Hall.
Robertson, John,	Mt. Carmel,	Pa.	Dr. A. F. Tod.
Robertson, Wm. Franklin,	Waelder,	Tex.	Dr. H. W. Robertson.
Roth, Theodore Wm.,	Philadelphia,	Pa.	G. H. Ischler.
Rothermel, John Palmer,	Kelly's X Roads,	Pa.	C. H. Clark.
Rothwell, Walter,	Hatboro,	Pa.	Dr. S. D. Marshall.
Ruff, W. Gilbert,	Bryansville,	Pa.	S. E. R. Hassinger.
Rynard, Chas. Warren,	Harrisburg,	Pa.	J. B. Nicholas.
Sahm, Louis Napoleon,	Boonville,	Mo.	Wm. Mittelbach.
Scheirer, Victor D.,	Allentown,	Pa.	A. B. Wenrich.
Schmehl, Irvin.	Reading,	Pa.	Dr. L. G. Bauer.
Schmerker, Chas. Frederick,	Allentown,	Pa.	G. K. Binkley.
Schneider, Chas.,	Philadelphia,	Pa.	W. H. Zeigler.
Schroeder, Martin Bernard,	Philadelphia,	Pa.	J. A. Murtagh.
Schuster, Jos. Barnard,	Egg Harbor,	N. J.	Bullock & Crenshaw.
Scott, Geo. Colton.	Philadelphia,	Pa.	J. T. White.
Scull, James Ireland,	Atlantic City,	N. J.	A. D. Cuskaden.
Shafer, Erwin Clement,	Montoursville,	Pa.	G. C. Saeger, M.D.
Shaw, Frederick Chas.,	Zanesville,	O.	W. M. Chappelear & Sons Co.
Sheehan, Edward Joseph,	Utica,	N. Y.	J. Ogden & Co
Shumaker, Chas M.,	Manning,	Ia.	Dr. G. M. Barber.
Sickel, Wm. A.,	Bristol,	Pa.	E. Martin.
Siegfried, Howard Jos.,	Nazareth,	Pa.	E. M. Boring.

Name.	*Place.*	*State.*	*Preceptor.*
Simmons, Frank Waters,	Pottsville,	Pa.	W. H. Smith.
Simmons, Geo Arthur,	Moores,	Pa.	F. E. Harrison.
Singer, Robt. Lamberton,	Harrisburg,	Pa.	Dr. A. E. Eyster.
Slick, Ross Merryman,	Mechanicstown,	Md.	H. G. Shinn.
Smith, Allen Henry,	Quakertown,	Pa.	T. E. Conard.
Smith, Daniel Evans,	Millville	N. J.	Dr. H. C. Smith.
Smith, Geo. Lewis,	Orrstown,	Pa.	J. B. Moore.
Smucker, Milton Clyde,	Newark,	O.	F. D. Hall.
Sorber, Louis Samuel,	Fall of Schuylkill,	Pa.	J. T. White.
Sparks, Edgar Reed,	Philadelphia,	Pa.	W. E. Lee.
Stanger, Lawrence Albertson,	Frankford,	Pa.	C. A. Roberts.
Stanton, Thomas Jefferson,	Chester,	Pa.	R H. Henderson.
Stedem, Lawrence Sylvester	Aloysius, Logan,	O.	F. W. E. Stedem
Steele, John Wesley,	Easton,	Pa.	G. J. Pechin.
Stem, Harvey Nevin,	Stemton,	Pa.	L. C. Funk.
Stewart, John	Philadelphia,	Pa.	Eberly Brothers.
Stiles, Wm. Hubert,	Camden,	N. J.	E. C. Jones.
Sultzbach, Harry Miller,	Marietta,	Pa.	Dr. J. F. Meade.
Sutton, Samuel,	Wilkesbarre,	Pa.	W. D. White & Co.
Taggart, Geo. Corson,	Norristown,	Pa.	H. R. Giffin.
Taylor, Harry Baker,	Altoona,	Pa.	E. S. Taylor.
Taylor, Howard Davis,	Smyrna,	Del.	N. Davis.
Taylor, Merle Hampton,	Butler,	Pa.	J. H. Parks.
Terne, Henry Bruno,	Philadelphia,	Pa.	Bullock & Crenshaw.
Thompson, Jos. Brinton,	Cochranville,	Pa.	Dr. Henderson.
Tragesser, Edward Charles,	Lancaster,	Pa.	Dr. J. Long.
Troop, Wm. Winebert,	Reading,	Pa.	C. M. Steinmetz.
Trump, Thaddeus Thomas,	Canton,	O.	Weber Brothers.
Turner, Philip Percy,	Millington,	Md.	H. Diefenbeck.
Ueberroth, Harvey Milton,	Bethlehem,	Pa.	Paul Kempsmith.
Umstead, Walter Horace,	Salem,	O.	Bolger & French.
Van Buskirk, Thomas Franklin,	Bethlehem,	Pa.	Dr. S. L. VanBuskirk.
Van Dyke, Albert Nelson,	Philadelphia,	Pa.	F. P. Lins.
Voss, Frederick J.,	Borgloh,	Germany,	Dr. Usilton.
Wahle, Edwin,	Davenport,	Ia.	T. H. Busch.
Walter, Andrew Wendel,	Philadelphia,	Pa.	J. B. Ferguson.
Walton, Harry Hurley,	Philadelphia,	Pa.	W. H. Lacey.
Walls, John Henry,	Media,	Pa.	A. Roidot.
Walz, Frank James,	Harrisburg,	Pa.	Dr. M. F. Raysor.
Weisner, Nicholas Frederick,	Leesport,	Pa.	L. A. Podolski.
Westcott, Frank,	Media,	Pa.	W. E. Dickeson.
Westphal, Carl Henry,	Hamburg,	Germany,	E. Graff.
Whilt, John Henry,	Philadelphia,	Pa.	Dr. I. R. Landis.
White, Charles H.	Titusville,	Pa.	G. B. Evans.
White, Preston Barnes,	Chambersburg,	Pa.	C. H. Cressler.
Wier, Jr., Thos. Jefferson,	Annapolis,	Md.	N. B. Danforth.
Wilkinson, Howard Marion,	Camden,	Del.	F. H. Davis.
Wilkinson, Richard Powers,	Philadelphia,	Pa.	F. Bowker.
Williams, Chas. Morgan,	Lambertville,	N. J.	F. C. Lehman.
Williams, Clarence Edward,	Philadelphia,	Pa.	Bullock & Crenshaw.
Williams, Harry,	Laurel,	Del.	Dr. A. W. Duvall.
Winch, Howard Geo.	Bethlehem,	Pa.	H. L. Barber.
Wingert, Wm. Harry Kitzmiller,	Knoxville,	Tenn.	G. A. Wingert.
Wittel, John Kaler,	Florin,	Pa.	L. Seipel.
Woertz, Geo. Augustus,	Philadelphia,	Pa.	W. A. Auffurth.
Wohlgemuth, Julius,	Philadelphia,	Pa.	G. D. Borton.
Wollmuth, Richard Julius,	Bethlehem,	Pa.	C. H. Tatem.
Yohn, Charles Ragan,	Hagerstown,	Md.	J. H. Munson.
Zimmerman, Howard,	Mt. Carmel,	Pa.	E. W. Sharp.